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ANNALS of SURGERY

A Monthly Review of Surgical Science and Practice

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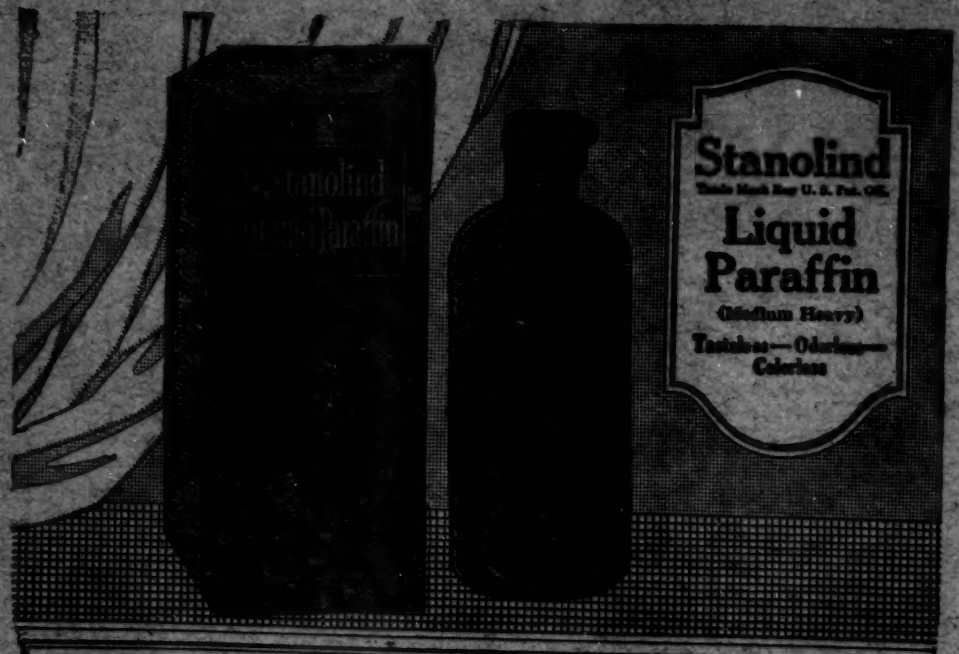

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ANNALS *of* SURGERY

VOL. LXVI AUGUST, 1917 No. 2

A CLEAN AND COMFORTABLE METHOD OF TREATING ERYSIPELAS PATIENTS*

BY SETH M. MILLIKEN, M.D.
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SURGEON TO LINCOLN HOSPITAL; ADJUNCT ASSISTANT SURGEON TO BELLEVUE HOSPITAL

IT is my belief that there is not any method of treatment for erysipelas that has proved to be curative. The following is suggested as making the patient most comfortable during the disease, thereby conserving his energies and perhaps hastening nature's cure.

Method.—The patient is cleansed and put to bed. Rest is enforced during the acute fever and for two days after the temperature reaches and remains below one hundred. At the start calomel and salts are given and diet allowed according to the patient's appetite. Fluids are forced during the fever. Sedatives or stimulants are given if indicated by mental or circulatory symptoms.

Whenever ichthyol has been previously applied, as so frequently happens, it is removed as thoroughly as possible from so tender a surface. Then, if no wound demands local dressing, the entire region attacked by the disease is thickly dusted with powdered stearate of zinc which is reapplied as it falls or is brushed off. If a wound exists, it is treated as a similar wound would be treated in the absence of erysipelas. Thus, the face of a patient with abscess in the eyelids is powdered freely and the eyes kept moist with small compresses renewed from a basin of cold boric acid, a drop or two of 20 per cent. argyrol is placed on the conjunctivæ from two to five times in twenty-four hours according to the local irritation evident. If in leg cases periphlebitis or cellulitis develops an incision is made as soon as fluctuation appears, and then wet dressings of boric acid or magnesium sulphate solution or dilute alcohol are applied.

This method was adopted as routine during my last service in the Bellevue Erysipelas Wards, November 16 to December 31, 1916, inclusive.

I would here like to thank my chief, Dr. Joseph B. Bissell, Director of the Fourth Surgical Division, for permission to use this method and report the results, as well as for various courtesies shown me heretofore.

* Read before New York Surgical Society, March 14, 1917.

My first tests were in little babies with erysipelas, because I early noticed that, under the wet dressings of the adopted routine, the subsidence of the fever was often accompanied by alarming depression and subnormal temperature requiring stimulants and the application of heat.

In searching to avoid this, I found that Osler says "The inflamed region may be covered with salicylate of starch." As this material was not available the stearate of zinc was substituted with gratifying results.

During the last three periods of my Bellevue service, I have used the stearate dressing for all babies with erysipelas and for adults where the trunk was involved, and the results were so satisfactory that I decided to eliminate as far as possible all wet dressings and use the powder. The results were more satisfactory than any I had observed.

I believe this method has the following special advantages: first, the powder protects the inflamed area better than any other application and is fully as soothing. (It was especially noticed that where blebs were present they were better protected than under wet dressings which macerate and tear off the loose surface, and if the bleb broke the loose epithelium under the powder was not removed but remained to protect the sensitive base of the blister.) Second, the serum from blebs or other discharges does not make a hard scab with this dressing. Third, the patient's general comfort is tremendously increased, as the bed is not cold and sloppy, and the patient is relieved of the duty of renewing compresses. Fourth, under wet treatment in extremity cases there was frequent complaint of the hard crusty dressing when it became dry. This annoyance is obviated by the powder. Moreover, the nurses are able to give far more attention to the patient's comfort and condition, as no time is required to renew solution bowls, get ice, and change wet sheets, thus hospital supplies are conserved. Again, the Drug Department estimates that it is cheaper because no labor is required of them and container breakage is eliminated.

I have the temperature sheets of fifty-four cases treated in this service. The average duration of elevated temperature, that is above one hundred, was a small fraction under four days, the longest was twenty-one days. This was in a woman with the migratory form of the disease following an extensive suppuration of the tendon sheaths of the hand and forearm. The erysipelas progressed all over her body below the neck. The average duration of fever in the typical face cases, thirty-two in number, was a small fraction under three days. I would not at this time place too much importance on these figures as the virulence of erysipelas is well-known to run in waves, and, although in these patients the disease seemed to show average malignity as judged by the local conditions and the temperature reaction, it may well be that the infection was of less than average severity during the period of this service.

This method was continued by my successor in the Bellevue service

and I hope later to report statistics of sufficient volume to be of real value.

I have found no indications for internal medication in erysipelas, and Osler says there are none. In fact all the text-books I have consulted damn with faint praise the internal treatment which each seems to find it necessary to suggest.

Under local treatment, Osler says, " Of local applications ichthyol is at present much used. The inflamed region may be covered with salicylate of starch. Perhaps as good an application as any is cold water which was highly recommended by Hippocrates." The most recent publication that I have seen, which is Moorhead's "Traumatic Surgery," says, " Local measures have been recommended almost without number and cures often ascribed to them with about as much basis as if they had been similarly used to hasten the desquamation of scarlet fever, measles or any other disease of self-limited type." This agrees exactly with my opinion.

It may be well to mention some of the more or less well-known methods.

The vaccine method has not appealed to me and after Erdman's [1] experience at Bellevue I did not further try it.

Of local methods thought to act as cures I may mention the injection of antiseptics in front of the advancing margins.

I early learned that the streptococci advance irregularly ahead of the typical margin and in the few cases in which I saw it used the effect was ludicrous, the disease appearing beyond the injected area on schedule time. Sloughs due to the injection have been reported. One method that appealed to me theoretically and to which I gave a thorough trial was painting the involved area and a wide margin beyond with 95 per cent. phenol later neutralized with alcohol. The successes were in no greater proportion than by palliative treatment and I stopped it after getting a superficial necrosis on the tip of the ear in one case and almost at the same time having a doctor, who had re-painted his mother's leg because my application had not checked the advance, report that she was voiding smoky urine containing casts and albumen. Once I saw a sort of lattice fence painted with 95 per cent. phenol around the indurated margin. The erysipelas jumped the fence, roamed awhile and disappeared, leaving the fence to be erased by painstaking and pain-giving dressing. I have not used it myself. A somewhat similar method was painting a stripe or boundary board with iodine or silver nitrate about the inflamed area. To my eye it made a jarring color scheme and evidently increased the patient's subjective burning without affecting the course of the disease.

It seems to me that the most objectionable treatment and apparently the one most frequently employed, outside of hospitals, is be-

[1] Jour. A. M. A., December 6, 1913, p. 2048.

smearing the patient's inflamed area with grease containing some mixture of ichthyol. This causes neither subjective nor objective relief, is a dirty malodorous mess that firmly adheres to the tender skin and makes a nasty scab during desquamation, especially where hairy surfaces are involved. Other ointments vary from the above chiefly in color. They are objectionable because difficult and painful to remove.

In Bellevue and in most hospitals wet cold dressings had been adopted as routine treatment and were apparently somewhat alleviating. I object to aluminium acetate because it is disagreeably sour-smelling and frequently small pustules form under it which cause considerable itching and if confluent produce superficial ulcers. A saturated aqueous solution of picric acid has a very astringent effect on moist areas, but leaves a stain until desquamation is complete, or longer if it has been repeatedly applied.

Dilute alcohol 20 to 50 per cent. applied on thick dressings and allowed to evaporate is very pleasant at first and slightly dehydrating. It is messy when wet and scratchy when dry, and if removed when dry pain is caused and a waffle-iron appearance conforming to the mesh of the gauze is left. As above stated, continuously renewed cold wet dressings were routine on the service. Usually boric acid solution was applied to the face, acetate to the extremities and ointment boric, not ichthyol, to the trunk.

My former routine was saturated solution of magnesium sulphate during the acute stage with fever, and no dressing during desquamation. This was used hoping that the magnesium sulphate had a slightly analgesic effect, but in these cases the powder was apparently just as soothing locally and certainly much neater and more comfortable generally.

I would like to add just a word on diagnosis.

It is usually stated that the lymph-nodes are enlarged in erysipelas. This does not agree with my observation, which is that the lymph-nodes are not enlarged unless suppuration is beginning, and I believe this sign is of great value in making the differential diagnosis between cellulitis and erysipelas, especially in leg cases where the symptoms are not as typical as in face cases. In doubtful cases I believe that we may say that it is not erysipelas if the femoral glands are enlarged.

OBSERVATIONS ON THE NATURE OF POST-OPERATIVE LEUCOCYTOSIS IN THE DOG

By Edward B. Krumbhaar, M.D.

of Philadelphia

(From the John Herr Musser Department of Research Medicine, University of Pennsylvania)

In a previous work on the blood picture at various periods after splenectomy,[1] mention was made of the constant occurrence of a polymorphonuclear leucocytosis immediately after removal of the dog's spleen. This was considered to be different from the ordinary post-operative leucocytosis because of the fact that although the operation was done under complete aseptic precautions, it was practically bloodless and lasted only fifteen or twenty minutes, nevertheless the leucocyte count always passed 30,000 per cubic millimetre (an increase of over 200 per cent.), and continued in a lesser degree above normal for several days or even two or more weeks. This comparatively long duration of the leucocytosis is even more striking in some human blood counts after removal of the spleen (Musser[2] and others). Since the above work was completed, however, leucocyte counts on dogs have shown that equally high figures may be obtained shortly after other aseptic operations. Furthermore, Dr. N. M. Percy[3] has found that a transient lymphocytosis occurs while the spleen is being removed for pernicious anæmia. It has therefore seemed advisable to study post-operative leucocytosis more intensively, and as the effect of etherization and of hemorrhage on the leucocyte count also has remained undecided, studies on these two features have also been included.

Numerous studies, dating mostly from fifteen or twenty years ago (White,[4] Da Costa and Kalteyer,[5] Cabot, Blake and Hubbard,[6] and others), have resulted in the establishment of fairly definite figures for the average height and duration of post-operative leucocytosis in man. Not only have such figures been wanting for the dog, however, but also it has seemed as if counts at more frequent intervals than has hitherto been attempted might throw more light on the mechanism involved.

Method.—To this end, total leucocyte and differential counts have been made on 20 dogs, either normal or in the leucopænic stage of trypanosome anæmia, before and after ether narcosis, hemorrhage and various surgical operations. One or more counts having been taken previous to the experiment, in most cases subsequent counts were made every ten or fifteen minutes for the first hour, then hourly for the rest of the day, and finally every day or two until the count returned to normal. For the leucocyte counts, 2 square millimetres were counted

from drops from different parts of the Thoma pipette, according to the usual method; and for the differential count 200 to 500 leucocytes, stained by Wright's method, were examined. It is of course recognized that no significance can be attached to small changes that may be within the factor of error, and also that the individual response to a given procedure may vary greatly. The leucocytes were classified in the four customary groups: (1) polymorphonuclear leucocytes; (2) small mononuclears or lymphocytes; (3) large and transitional mononuclears, and (4) eosinophiles. (Mast cells occur rarely if ever in normal dog's blood.) As will be noted later, various forms were found that varied from the typical description of these four classes; but for the

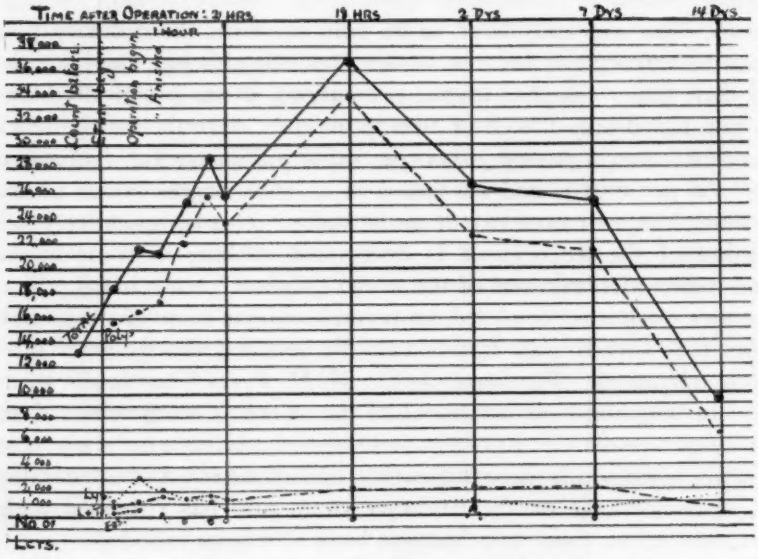

FIG. 2.—No. 17.19. Post-operative leucocytosis. Bile-duct-ureter anastomosis.

sake of clarity in the charts these have not been given separate recognition.

Most of the counts were made on dogs after removal of a kidney, spleen or eye, or after anastomosis of the common bile-duct with the ureter. Two experiments were on dogs etherized for an hour, using about 3 ounces of ether by intratracheal anæsthesia. Two other experiments were on dogs that had had 75 c.c. of blood withdrawn from the jugular vein in three minutes without anæsthesia; in one other this fresh blood was reinjected into the peritoneum, to simulate internal hemorrhage; and in another an accidental fatal internal hemorrhage occurred after nephrectomy from slipping of a ligature. In none of the dogs considered in this work were any signs of distemper or other acute infection visible. A temporary post-operative rise of temperature was of course present.

Post-operative Results.—From the accompanying charts it will be

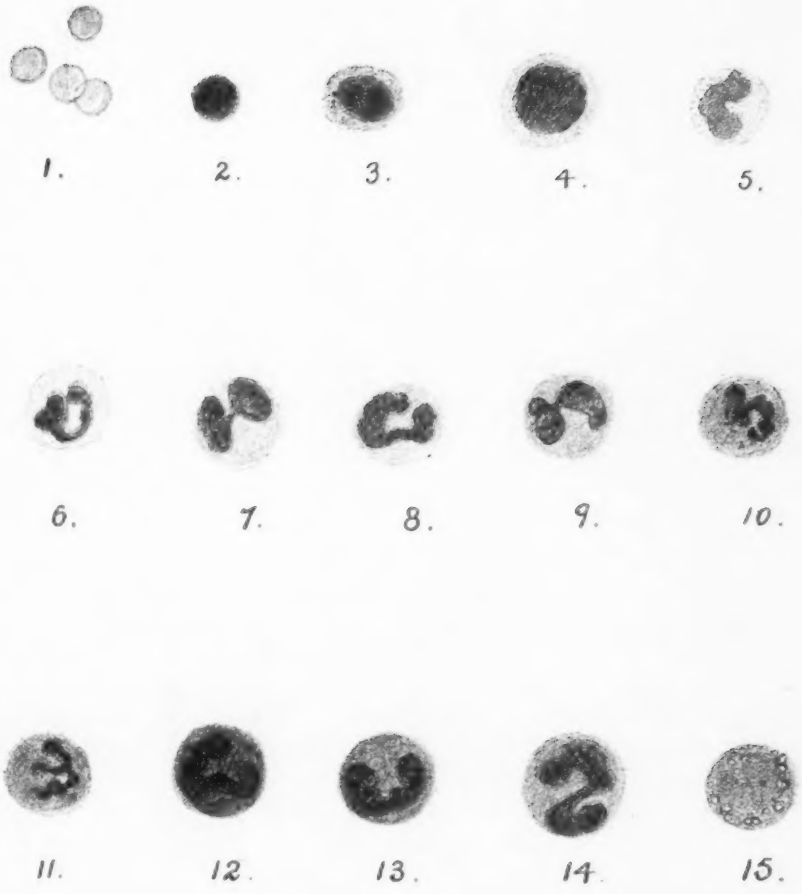

FIG. 1.—Appearance of cells in post-operative blood smears from the dog. 1, normal erythrocytes; 2 and 3, small lymphocytes; 4, basophilic lymphocyte (irritation form, Turk?); 5 and 6, young and adult polymorphonuclear leucocytes (Arneth); 7 to 11, intermediate leucocytes, showing different grades between polymorphonuclear and transitional forms (form of nucleus, staining reaction of protoplasm); 12 to 14, transitional and large mononuclear cells; 15, eosinophilic leucocyte. Note vacuoles and absence of definite eosinophilic granules. To increase ease of selection and reproduction, specimens were selected from two smears. Wright's stain. Zeiss, Homog. imm. $\frac{1}{12}$. Eye piece 4.

seen that the post-operative leucocytosis of splenectomy is essentially the same as that of other operations, so that the four post-operative charts may be considered together. Starting almost immediately after etherization (noted in one instance within three minutes of beginning etherization), a leucocytosis becomes evident, and after a slight pause (to be considered later) reaches a maximum in about eighteen hours. This great rise is almost entirely due to the polymorphonuclear elements, although the large and transitional group is also affected, especially in the latter half of the leucocytosis. Although the numerical changes in the latter group appear insignificant on the chart as compared with the extreme polymorphonuclear change, the figures in the ordinate column show that these forms have sometimes doubled or trebled in number. Furthermore, qualitative changes of two kinds are observed in the polymorphonuclear group. The nuclei of a distinctly greater number possess only one or two lobes (a shift of the Arneth scale to the left); and in other cells (between 2 and 10 per cent. in different animals at different times) the general appearance of the cell approaches to a greater or less degree that of the so-called transitional cell. This cell, which for the sake of convenience I have called an "intermediate" cell, is slightly larger, the protoplasm more opaque and without definite neutrophile granules and the nucleus of a more compact shape and taking a less brilliant purple stain. In fact, so many gradations of these changes (approaching the polymorphonuclear cell at one extreme and the transitional at the other) are sometimes found, that their proper classification in one or other of these groups becomes entirely arbitrary.

The small lymphocytes or small mononuclear cells, except for an early transient rise (which will be considered later), show practically no quantitative change. A qualitative change is noted, however, in that one of the subdivisions of this group is represented more frequently. In the normal differential count of dog's blood, a few of the lymphocytes (two or three per cent.), when stained by Wright's method, show a protoplasm of Prussian blue, resembling Turk's irritation forms, and are considerably larger than the ordinary small lymphocyte. These are often increased to 10 or more per cent. of the small mononuclear group after operation. As the reaction of these and the "intermediate" cells to other stains has not been investigated, no attempt can be made to determine their true position in the leucocyte family. Attention should be called, however, to their appearance in the blood stream after operation.

The eosinophiles, as has been noted in human post-operative leucocytosis, are either diminished or in many cases disappear entirely from the peripheral blood for many hours after operation.

The leucocytosis following splenectomy differs only from other post-operative leucocytoses in that it tends to last longer. Thus in

Fig. 3 it will be seen that the leucocyte count is still above normal when the last count was made eight days after operation. In Fig. 4 the quicker return to normal is probably to be accounted for by the youth of the animal. The longer duration of the leucocytosis is in accord with Bernheim, King and Jones'[7] recent observations that the rise in the count of the various blood-corpuscles after blood transfusion is longer maintained in splenectomized than in normal animals.

Opportunity was offered by coincident work in this laboratory on trypanosome anæmia in dogs to study as well the leucocytic response to operation of leucopænic animals. For several weeks after infection,

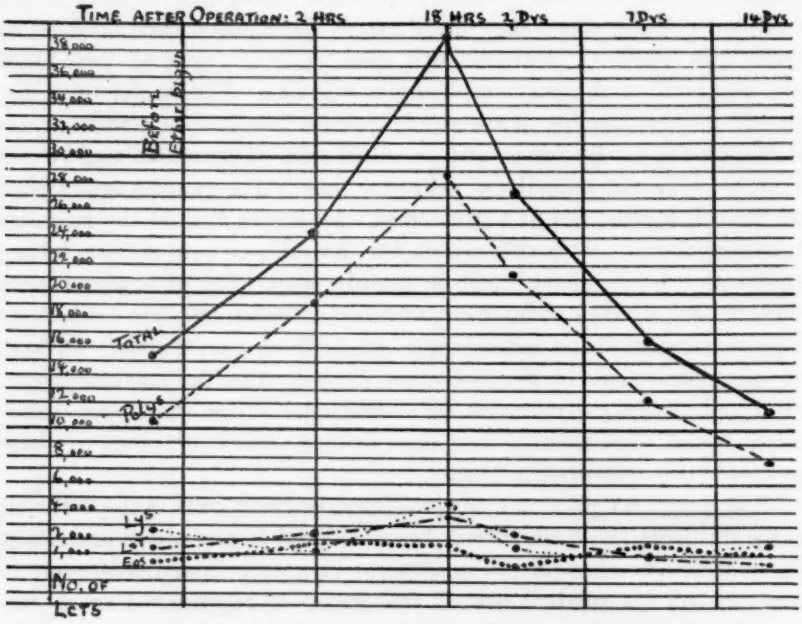

FIG. 3.—No. 16.71. Post-operative leucocytosis. Bile-duct-ureter anastomosis.

T. equiperdum causes a progressive leucopænia, reaching as low as 5000 or 6000 cubic per millimetre. When dogs are operated upon at this stage, whether for splenectomy (16.69) or other surgical procedures, such as removal of an eye (16.93), a post-operative leucocytosis of the same nature as in normal dogs occurs. It often fails, however, to attain as high a level, and may take three or four days to reach its maximum. As the bone marrows of these animals are definitely hyperplastic (chiefly leucoblastic), this delayed response, like the Arneth shift to the left and the appearance of intermediate cells, would indicate that post-operative rise is chiefly, at least, due to the summoning of new leucocytes from the bone marrow, which in the leucopænic trypanosome dogs cannot be so well or so quickly supplied.

Narcosis.—Charts of the two dogs etherized for one hour show that a definite leucocytosis is produced, and that it characteristically

exhibits two distinct phases. These may be considered as inversely analogous to the proto- and deutero-phases of benzol leucopænia,

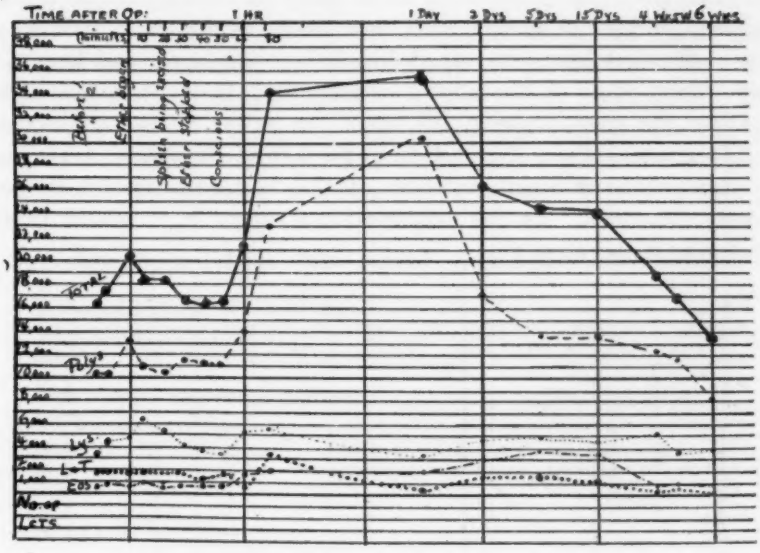

FIG. 4.—No. 17.03. Post-operative leucocytosis. Splenectomy.

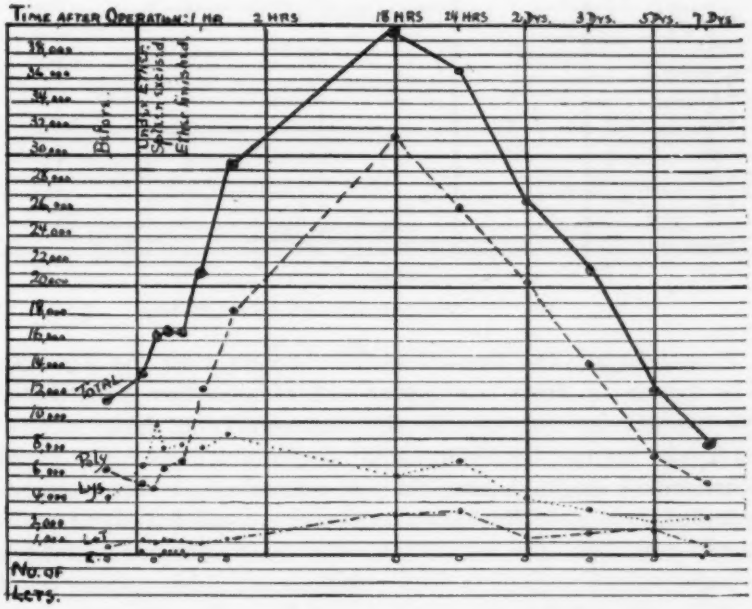

FIG. 5.—No. 17.07. Post-operative leucocytosis. Splenectomy.

described by Weiskotten, Schwartz and Steensland.[8] The first rise, which reaches its maximum in the first half-hour and may already

disappear before the end of the hour's etherization, is due to an increase in small mononuclears as well as in the polymorphonuclear cells. Its influence can be observed in those post-operative charts in which a sufficient number of early counts were made, as the small peak occurring in the first hour after operation, before the larger and later rise. The second phase is due almost entirely to polymorphonuclear cells, and like the post-operative rise shows to a less degree an increase in transitional cells, a slight shift to the left of the Arneth scale, and the appearance in small numbers of the "intermediate" cells previously described. In the post-operative charts it is buried in the greater post-operative rise.

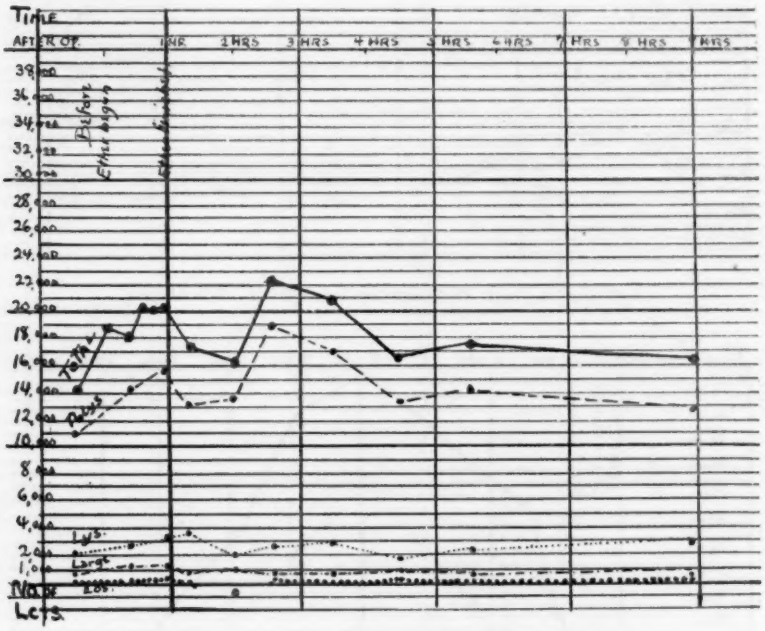

FIG. 6.—No. 17.30. Narcosis leucocytosis. Ether one hour.

Hemorrhage.—The leucocytosis that occurs after the withdrawal of 75 to 100 c.c. from the jugular vein of a medium-sized dog (10 kilos) is definite, but of different character from those previously described. Except for slight initial fluctuations, the count remains unchanged for several hours. As post-hemorrhagic hydræmia was not controlled, it is possible that an earlier rise could have been masked by such a factor. The red cell count in the two dogs examined was only slightly reduced (less than 1 million per cubic millimetre) for the first hour and then remained normal throughout the experiments. The leucocyte count begins to rise after four or five hours, almost doubling in the first thirty hours, and gradually declines to normal during several days. In one dog the rise was due entirely to poly-

morphonuclears, in the other both polymorphonuclears and small mononuclears were increased. In a third experiment (No. 17.34) an equivalent amount of blood (100 c.c.) was withdrawn from the jugular vein during a period of five minutes. As fast as it was withdrawn it was reinjected into the same dog's peritoneal cavity, thus attempting to simulate the conditions of an internal hemorrhage. One needle was left in the jugular vein during the transference and another in the peritoneal cavity. The whole fresh blood was transferred by the alternating use of 20 c.c. syringes, without defibrinating. As

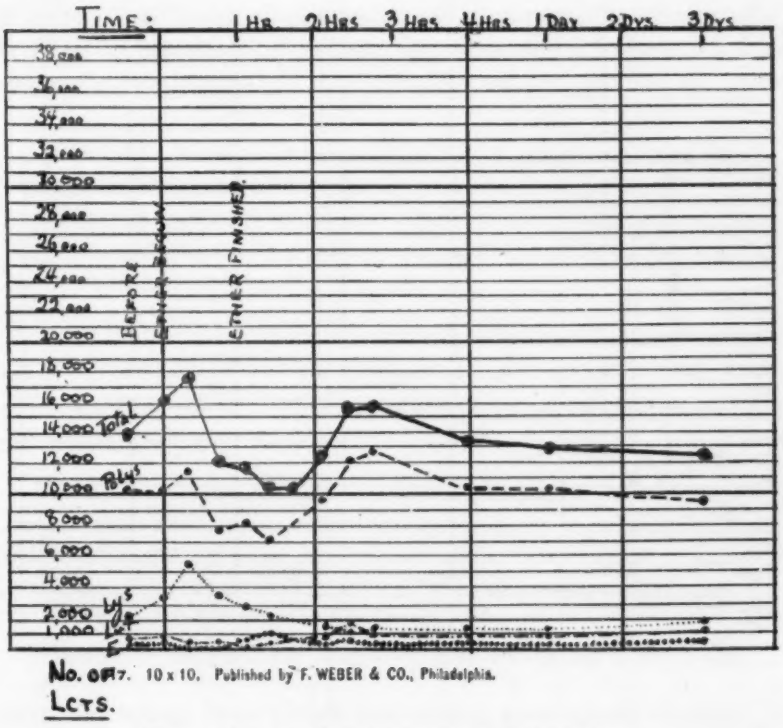

FIG. 7.—No. 17.28. Narcosis leucocytosis. Ether one hour.

Sweet [9] has recently shown that fresh blood in the peritoneal cavity is rapidly taken up in large quantities by the thoracic duct and thus reintroduced into the circulation, it was thought that the stimulus to leucocytosis caused by the loss of blood from the body might thus be overcome. It will be seen that there was no noteworthy change for eight hours, and then only two counts (at twenty and thirty hours) showed a rise in leucocytes, similar to those previously described. It is of course impossible to know whether any of the injected blood underwent coagulation. Such coagulation would not only impede reabsorption but on disintegrating would afford more than sufficient stimulus for the late rise that was noted. It will also be noticed that

an extreme leucocytosis, such as Dold [10] considers of value in the diagnosis of internal hemorrhage, was not found in this dog. In another animal (17.35), whose leucocytes were being followed after removal of a kidney, a fatal internal hemorrhage followed slipping of a ligature. Although the final count was made as the animal was dying, the leucocyte counts maintained an almost constant level, showing on the one hand that copious hemorrhage may continue for at least five hours without leucocytosis; but on the other hand, that the leucocyte count, unlike the red cell count, may be maintained until the moment of death.

Summary.—Splenectomy, like other aseptic operations, causes in the dog a marked leucocytosis that reaches its maximum in about 18 hours. In normal dogs the highest count, if frequent enough counts

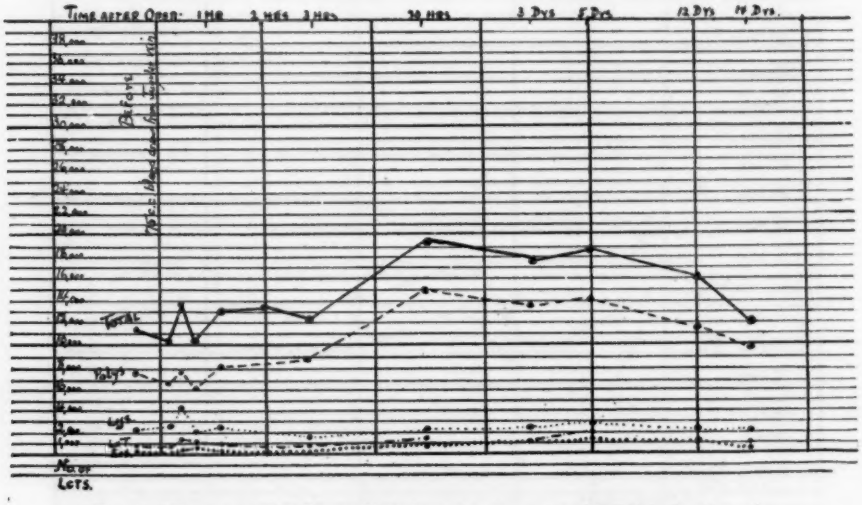

FIG. 8.—No. 17.27. Post-hemorrhagic leucocytosis. 75 c.c. bled from jugular vein.

are made, is always over 30,000 and usually over 40,000 per cubic millimetre. Post-operative leucocytosis in dogs lasts from four to seven days, but post-splenectomy leucocytosis is usually more protracted.

The leucocytosis is almost entirely due to the polymorphonuclear leucocytes. The proportion of younger forms is increased (Arneth shift to the left) and "intermediate" forms appear, that partake of some of the characteristics of so-called transitional cells. The later group is increased and eosinophiles are diminished or disappear from the peripheral blood.

In dogs in the leucopænic stage of trypanosome anæmia, surgical operation does not cause such an extreme leucocytosis and it may take several days instead of hours to reach its maximum.

Uncomplicated narcosis (ether) produces a rise of from 3 to 10,000, occurring characteristically in two phases. The first of these phases reaches its maximum in fifteen to sixty minutes and is due to

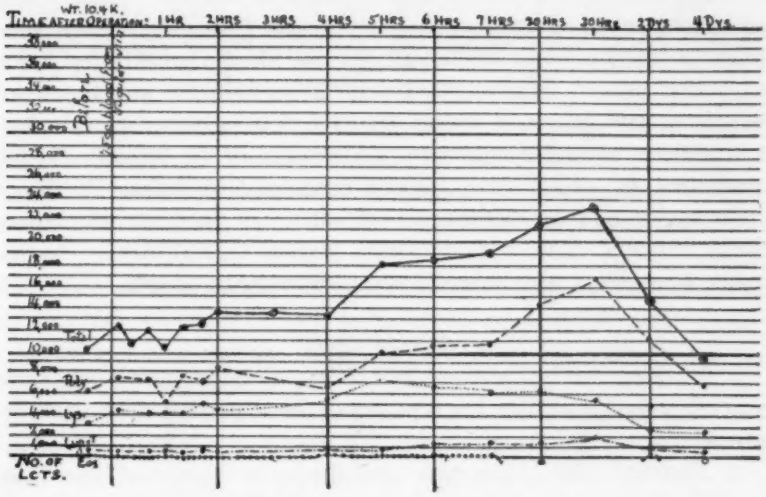

FIG. 9.—No. 17.29. Post-hemorrhagic leucocytosis. 75 c.c. bled from jugular vein. Red blood-cell was lowered less than 1 million in the one-hour count, was normal from two-hour on.

an increase both in the polymorphonuclear and small mononuclear elements. The second rise usually begins in about two hours and is practically finished in another two hours. The first of these is prob-

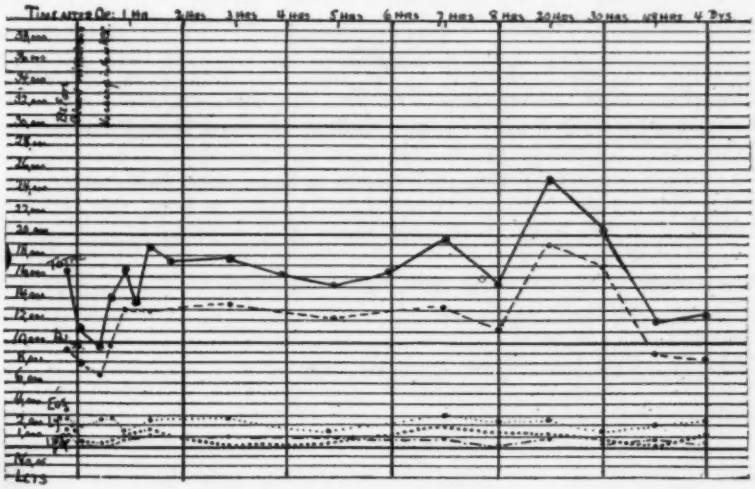

FIG. 10.—No. 17.34. Post-hemorrhagic leucocytosis. Internal. 100 c.c. from jugular vein, reinjected intraperitoneally.

ably due to a direct irritant effect of the ether (positively chemotactic to the lymphocytes), the second to a summoning of new polymorphonuclears from the bone-marrow, as in post-operative leucocytosis.

Hemorrhage of moderate amount causes a leucocytosis of 100 per cent. or more, that typically does not become apparent for four or five hours, reaches its maximum in the first twenty-four hours, but may take more than a week before it returns to normal. These changes are more marked in external than in internal (intraperitoneal) hemorrhage of equal amounts of blood. In one animal an internal hemorrhage that proved fatal in five hours failed to cause any noteworthy change in the leucocyte count up to a few minutes before death. It is difficult to understand why withdrawal of an amount of blood, insufficient to cause more than a fleeting disturbance in the red blood count, and in the absence of ether or operative disturbance, should cause a distinct leucocytosis lasting several days. As such occurs, however, a bone-marrow stimulant must be sought.

CONCLUSIONS

1. In dogs, the leucocytosis that followed splenectomy only differs from other post-operative leucocytoses in the somewhat slower return to normal.

2. Post-operative leucocytosis, and the lesser degrees of leucocytosis that follow narcosis and hemorrhage, are chiefly due to the summoning of new and younger forms of polymorphonuclear cells from the bone-marrow into the peripheral blood stream.

3. The appearance of "intermediate" forms in the blood stream after operation suggests that a relationship exists between the polymorphonuclear leucocyte and so-called transitional cells.

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THE VALUE OF THE LEUCOCYTE COUNT IN THE DIAGNOSIS AND PROGNOSIS OF ACUTE APPENDICITIS, AS BASED ON EXPERIENCE IN ONE HUNDRED CASES

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The value of the leucocyte count in the diagnosis of acute inflammatory diseases is now well recognized. It is necessary, however, with all laboratory work to correlate the laboratory results with the findings obtained at the bedside. This dictum is as true in the consideration of the relation existing between the behavior of the leucocytes in acute appendicitis as it is in any other acute surgical disease. As DaCosta[1] has stated: "The surgeon who attempts to use the blood count in appendicitis as a definite pathognomonic sign will soon run afoul of diagnostic disasters, but he who regards it only as a symptom invariably to be correlated with equally if not more important clinical manifestations, cannot fail to find this method of inquiry of signal value in routine clinical surgery."

The counts here submitted have all been taken from cases of appendicitis clinically acute, and in so far as we have been able to ascertain, no coexistent infection has been present. All counts were taken within a few hours of operation and the great majority were taken immediately before the administration of the anæsthetic. In some instances several counts were made, but only the counts taken immediately before operation have been included in this series. The age of the patients ranged from fifteen to fifty-eight. The wide variation noticeable in the counts reveals the widely variant acuteness of the infection and the effort exerted by the resisting forces of the body.

An attempt has been made to classify these cases into simple groups, based upon the pathological condition found at operation, but, because of the diversity of the pathological processes, any simple classification upon such a basis was found impossible. For the purpose of convenience, however, the cases have been arranged in the following groups:

Group 1. Infection confined to the appendix. This group includes catarrhal cases, and all cases in which, on clinical evidence only, infection had not extended beyond the appendix.

Group 2. Appendix perforated, infection circumscribed, including gangrenous appendices and all cases where the infection had been delimited.

[1] Quoted by Fowler: "The Relation of the Lesion in Appendicitis to the Leucocyte Count." Surgery, Gynecology and Obstetrics, 1908, vii, 308.

Group 3. Appendix ruptured, with infection uncircumscribed, including all degrees of peritonitis from the very early type up to that of general peritonitis.

In the first division are classed 35 cases and the counts are here appended.

	Total White	Poly. Per Cent.	Small Per Cent.	Large	Trans.	Eosin.	Results
1	8,880	89	4.5	6.5	..	..	Recovery
2	15,200	77.5	11.4	4.5	5	1	Recovery
3	20,750	80	14	5	1	..	Recovery
4	16,000	72	19	8	1	..	Recovery
5	19,000	82.5	12.5	5	..	..	Recovery
6	11,560	85.5	5	4	5	.5	Recovery
7	11,040	91	5	3.5	.5	..	Recovery
8	19,800	88	8.5	3	.5	..	Recovery
9	17,000	85	6	8	1	..	Recovery
10	17,800	80.5	1.25	18.25	..	..	Recovery
11	42,000	93	3	2	2	..	Recovery
12	8,735	67.5	22.5	2	8	..	Recovery
13	11,600	93.5	2	3.5	1	..	Recovery
14	9,600	78	13	4	2	3	Recovery
15	17,600	72	16	10	2	..	Recovery
16	21,700	71	8	14	1	6	Recovery
17	8,300	87	8	3	..	2	Recovery
18	25,200	92.5	4.5	3	..	..	Recovery
19	12,800	82	11	7	..	..	Recovery
20	20,000	83	8	4	5	..	Recovery
21	29,200	91.5	6.5	1	1	..	Recovery
22	10,500	79	12	8	1	..	Recovery
23	13,400	71	23	1	5	..	Recovery
24	21,966	80.5	8.5	1	9	1	Recovery
25	14,200	80	14	4	1	1	Recovery
26	12,680	83	12	3	2	..	Recovery
27	8,080	72	20	8	..	..	Recovery
28	30,000	91	6	3	..	..	Recovery
29	20,400	80	12	..	8	..	Recovery
30	8,800	86	13	1	..	..	Recovery
31	10,800	74.5	23.5	1	..	1	Recovery
32	9,840	85	4.5	10	.5	.4	Recovery
33	6,200	50.5	30	19.5	..	..	Recovery
34	19,200	73	13	8.5	1.5	4	Recovery
35	33,000	80	16	4	..	..	Recovery

It will be noted that the absolute counts range from 6200 to 42,000, and that the differential counts range from 50.5 to 93,5. All of these cases were clinically acute.

Case 33 (absolute 6200 with 50.5 per cent. polynuclear) was considered acute previous to the operation. At operation, however, no evidence of an acute process could be found. The acuteness of the symptoms was evidently due to a kink of the appendix caused by an adventitious (Jackson's) membrane. This count has been included in this series to emphasize the fact that a simple mechanical condition may produce clinical evidence sufficient to justify a diagnosis of acute

appendicitis in the absence of leucocytosis, either absolute or differential.

The next low count, case 12 (absolute 8735 with 67.5 per cent. polynuclear), was taken in a case clinically acute. At operation, however, no pathological process could be detected macroscopically, but it is highly probable that histological examination of this particular appendix would have revealed evidence of an acute inflammatory process.

Cases 4, 15, 23, 27 and 34 were of the catarrhal type. Case 16 (absolute 21,700 with 71 polynuclear) was an extremely acute case in a girl of sixteen and it is difficult to discover a reason why the polynuclear count should have been so low. This would tend to emphasize the fact that a differential count may not always be *per se* of diagnostic importance.

Case 7 (absolute 11,040 with 91 per cent. polynuclear) was another acute case similar in many respects to case number 16. The patient was a girl of fifteen. In comparing case 7 with case 16 it may be stated that both appendices were distended with pus; that the pathological condition was similar in each instance; that these patients were young and vigorous, and in so far as one could determine, both should have possessed equal resistance to the infection. The conviction again forced upon one is that no two patients resist infection in the same manner, and further, that the count in each case should be applied as evidence to that particular case only.

Another observation is quite pertinent (Case 1 absolute 8080, polynuclear 89 per cent.; Case 17 absolute 8300, polynuclear 87 per cent.; Case 30 absolute 8800, polynuclear 86 per cent.). In these cases, had absolute counts alone been made, the only conclusion possible would have been that no infection existed. When the differential counts are taken into consideration the conclusion is justified that infection was certainly present. These three cases were extremely acute types; in one case the appendix showed one small spot of gangrene.

In summing up the counts in group 1, the following data may be recorded: Lowest absolute count, 6200; highest absolute count, 42,000; lowest polynuclear count, 50.5 per cent.; highest polynuclear count, 93.5 per cent.; average absolute count, 16,652; average polynuclear count, 81 per cent.

Passing to the next group we note first, that both the absolute and the polynuclear counts are generally higher, and also that the largest number of cases are classed in this group.

	Total White	Poly. Per Cent.	Small Per Cent.	Large	Trans.	Eosin.	Results
36	29,200	87	7	6	..	..	Recovery, gangrenous with large enterolith
37	33,800	73	12	15	..	..	Death, post-operative ileus
38	10,600	93	7	..	..	..	Recovery
39	25,600	82	18	..	..	..	Recovery
40	7,800	65	2	31	..	2	Recovery
	10				145		

	Total White	Poly. Per Cent.	Small Per Cent.	Large	Trans.	Eosin.	Results
41	7,600	80	14.5	5	..	.5	Death, embolism, gangrenous appendix
42	5,500	79	12	8	1	..	Recovery, gangrenous appendix
43	15,375	78	20	1	.5	.5	Recovery, gangrenous appendix
44	20,000	83	16	.5	.5	..	Recovery
45	12,900	84	13	3	..	..	Recovery
46	12,620	84	12	4	..	..	Recovery
47	25,400	89	10.5	.5	..	..	Recovery
48	10,400	89	10	..	1	..	Recovery
49	18,800	85	5	10	..	..	Recovery
50	32,400	92.5	2.5	2.5	2.5	..	Recovery
51	23,000	91.5	5	3.5	..	..	Recovery
52	29,400	91	6	3	..	..	Recovery
53	29,800	91	3.5	5.5	..	..	Recovery
54	13,733	86	9	5	..	..	Death, post-operative hemorrhage
55	13,200	78	7	13	2	..	Recovery
56	14,080	72	16.5	10.5	1	..	Recovery
57	35,160	89.5	5	4	1.5	..	Recovery
58	13,840	77.5	12.5	8	1	1	Recovery
59	21,000	94	2	4	..	..	Recovery
60	6,200	84	13.5	2	.5	..	Recovery
61	38,000	85.5	4.5	10	..	..	Recovery
62	17,900	93	4.5	2.5	..	..	Recovery
63	20,300	87.5	8.5	4	..	..	Recovery
64	15,375	78	1	20.5	.5	..	Recovery, gangrenous
65	14,200	78	19	1.5	.5	1	Recovery
66	18,800	85	9	4	1	1	Recovery
67	15,400	86	2	12	..	..	Recovery
68	24,300	80.5	9	9.5	.5	.5	Recovery
69	36,200	97	1	2	..	..	Recovery
70	28,500	92	4	2	2	..	Recovery
71	13,600	79	19	..	2	..	Death, post-operative pneumonia
72	13,500	88	12	..	..	..	Recovery
73	11,200	83	13	4	..	..	Recovery
74	20,000	80	18	2	..	..	Recovery
75	32,800	95	4	1	..	..	Recovery
76	23,200	80	19	1	..	..	Recovery
77	16,300	90	10	..	..	..	Recovery
78	23,000	93	7	..	..	..	Recovery
79	18,000	89	11	..	..	..	Recovery
80	12,320	83.2	8.6	8	.2		

Comment.—Case 40 (absolute 7800, polynuclear 65 per cent.) was a well circumscribed abscess existing for a good many days, hence the low count.

Case 37 (absolute 33,800 with polynuclear 73 per cent.); if one could judge by the count, one would say that the prognosis was especially favorable. This case was of the perforative type with limiting

adhesions. There was tympanites at the time of the operation, probably due to a localized peritonitis, although in so far as could be determined at the operation, the infection was circumscribed. The appendix was removed and the wound drained, but patient died on the sixth day from post-operative ileus. It might be stated that this was a neglected case; neglected not through any fault of the attending physician or surgeon, but because of the antagonistic attitude of the patient toward surgical intervention. Operation was performed on the fifth day following the initial symptoms; the condition was clinically serious at the time of operation.

Case 41 (absolute 7600 with polynuclear 80 per cent.) was acute with free pus; operation drainage only. The patient died suddenly on the second day, probably from embolism, although no autopsy was permitted.

The remainder were good or bad operative risks, or intermediate between these two extremes, the counts indicating quite accurately not only the condition found at the time of the operation, but also gave a definite idea of the patients' resistance to the infection, or, in other words, a definite idea of the prognosis.

Summing up Group two, the following data may be recorded: Lowest absolute count in Group two, 5500; highest absolute count in Group two, 38,000; lowest polynuclear count in Group two, 65; highest polynuclear count in Group two, 97; average polynuclear count in Group two, 87.3; average absolute count in Group two, 17,517.

Thus, it will be observed, that both the average absolute and the average polynuclear counts are higher than in Group one, the average polynuclear count being considerably higher.

Passing on to Group three, we find twenty cases with four deaths.

	Total White	Poly. Per Cent.	Small Per Cent.	Large	Trans.	Eosin.	Results
81	17,800	89	6.5	1.5	3	..	Recovery
82	18,000	86	11	3	..	..	Recovery
83	9,600	92	5	3	..	..	Death, general peritonitis
84	25,400	79	15.5	5.5	..	..	Recovery
85	35,800	92	5	3	..	..	Recovery
86	18,600	93	6	1	..	..	Recovery
87	22,100	91.75	1.75	6.5	..	..	Recovery
88	28,500	92	5	3	..	..	Recovery
89	32,400	92.5	2.5	2.5	2.5	..	Recovery
90	7,600	92	8	..	..	..	Death, general peritonitis
91	20,800	90.5	5	4.5	..	..	Death, post-operative hemorrhage
92	23,200	89.5	3.5	7	..	..	Death, embolism
93	16,640	84	9	7	..	..	Recovery
94	22,000	88	12	..	..	..	Recovery
95	19,000	89	11	..	..	..	Recovery
96	15,200	89	7	2	2	..	Recovery
97	19,400	94	6	..	..	..	Recovery
98	6,700	85	11	4	..	..	Recovery
99	14,288	93.5	2.5	1	.5	Deg. 2.5	Recovery
100	28,431	90.5	5	4.5	..	..	Recovery

Comment.—Case 83 (absolute 9600, polynuclear 92): this leucocyte count may be interpreted as indicating a severe infection with poor resistance, which was true (tympanites, localized peritonitis, etc.).

Case 91: diagnosis, general peritonitis; although all that was done for this patient was merely a drainage operation, an uncontrollable hemorrhage began the night following operation. I was called in the night about twelve hours after operation and sent the patient immediately to the operating room. We were able to obtain a donor on short notice and the patient was transfused with blood, but he was very weak, and did not survive. It was disclosed to us afterwards that this patient was a hæmophiliac.

Case 92 was also one of general peritonitis. The operation consisted of drainage only, with one incision over the appendix region and a second incision just above the pubis. The patient did famously until the evening of the tenth day, when he died very suddenly, probably from embolism, although no autopsy was allowed.

Case 90 was one of general peritonitis (absolute 7600, polynuclear 92). The leucocyte count gave a clue to her low resisting power. Drainage only was done, followed by Murphy treatment for peritonitis, but in spite of all our efforts the patient succumbed on the seventh day.

When we consider that we lost only four cases in twenty of general peritonitis, the results are certainly an improvement over former statistics.

With the exception of cases 98 (absolute 6700, polynuclear 85) and 84 (absolute 25,400, polynuclear 79) the polynuclear count in this group ranges rather close to the ninety mark; one of 84 per cent.; one of 85 per cent.; one of 86 per cent.; one of 88 per cent.; three of 89 per cent. and one of 89.5 per cent.; eight in all being below ninety and three only below eighty-eight. So it would seem if we are in any doubt regarding our diagnosis that a positive blood count (85 per cent. or more polynuclear) when taken in conjunction with the clinical manifestations of acute appendicitis would practically always clinch the diagnosis.

Summing up Group three, the following data may be recorded: Lowest absolute count, 6700; highest absolute count 35,800; lowest polynuclear count, 79 per cent.; highest polynuclear count, 94 per cent.; average polynuclear count, 89.5 per cent.; average absolute count, 20,072.

Comparing these figures with Group two, we note that the average polynuclear count is higher, 89.5 to 87.3, and that the average absolute count is also higher, 20,072 to 17,517.

A summary of the whole series gives the following data: Lowest absolute count, 5500; highest absolute count, 42,000; lowest polynuclear count, 50.5 per cent.; highest polynuclear count, 97 per cent.; average absolute count, 18,080; average polynuclear count, 85.9 per cent.

Further observations: Case 12, 8735, 67.5; case 27, 8080, 72; case 33, 6200, 50.5; case 40, 7800, 65. These are practically normal counts, and the only assistance obtained from them was that the infection, if one was present, was confined entirely to the appendix and this proved true.

Consider again cases: 1, 8080, 89 per cent.; 17, 8300, 87; 30, 8800, 86; 32, 9840, 85; 42, 5500, 79; 48, 10,400, 89; 60, 6200, 84; 83, 9600, 92; 90, 7600, 92; 98, 6700, 85.

The absolute count would hardly justify the conclusion that an infection was present, yet all were serious cases, two, in fact, died. So it seems reasonable to infer that a low absolute count with a high polynuclear count should always be looked upon as indicative of a serious lesion. The reader's attention is now directed to the following groups:

Group A.—Cases: 2, 15,200, 77.5; 3, 20,750, 80; 15, 17,600, 72; 24, 21,966, 80.5; 29, 20,400, 80; 34, 19,200, 73; 35, 33,000, 80; 68, 24,300, 80.5; 74, 20,000, 80; 76, 23,200, 80; 84, 25,400, 79. These cases were all good risks, both clinically and hæmatologically, and all recovered.

Group B.—Cases 8, absolute 19,800, polynuclear 88 per cent.; 18, absolute 25,200, polynuclear 92.5; 21, absolute 29,200, polynuclear 91.5; 28, absolute 30,000, polynuclear, 91; 36, 29,200, polynuclear 87; 39, absolute 25,600, polynuclear 82; 44, absolute 20,000, polynuclear, 83; 47, absolute 25,400, polynuclear, 89; 51, absolute 23,000, polynuclear 91.5; 57, absolute 35,200, polynuclear, 89.5; 59, absolute 21,000, polynuclear 94; 63, absolute 20,300, polynuclear 87.5; 78, absolute 23,000, polynuclear 93; 87, absolute 22,100, polynuclear 91.75; 94, absolute 22,000, polynuclear 88; 97, absolute 19,400, polynuclear 94.

It will be noted that in this grouping we have a high absolute count associated with a high polynuclear count. These cases were more serious than those of the previous group, yet all recovered.

Group C.—Case No. 11, absolute 42,000, polynuclear 93; No. 28, absolute 30,000, polynuclear 91; No. 50, absolute 32,400, polynuclear 92.5; No. 52, absolute 29,400, polynuclear 91; No. 53, absolute 29,800, polynuclear 91; No. 57, absolute 35,160, polynuclear 89.5; No. 61, absolute 38,000, polynuclear 85.5; No. 69, absolute 36,200, polynuclear 97; No. 70, absolute 28,500, polynuclear 92; No. 75, absolute 32,800, polynuclear 95; No. 85, absolute 35,800, polynuclear 92; No. 89, absolute 32,400, polynuclear 92.5; No. 100, absolute 28,431; polynuclear 90.5.

All reveal a very high absolute count as well as a high polynuclear count, showing that a high polynuclear count per se does not always indicate a bad prognosis. Case No. 11 (absolute 42,000, with polynuclear 93 per cent.) recovered without a bad symptom, as did also Case No. 69 (absolute 36,200 with polynuclear 97 per cent.).

Of the fatal cases none in group one were lost. The others may be classified as follows:

Case No. 37, absolute 33,800, polynuclear 73 per cent., cause ileus; case No. 41, absolute 7600, polynuclear 80 per cent., cause embolism; case No. 54, absolute 13,733, polynuclear 86 per cent., cause hemorrhage from wound (night of 8th day); case No. 71, absolute 13,600, polynuclear 79 per cent., cause pneumonia (post-operative); case No. 83, absolute 9600, polynuclear 92 per cent., cause general peritonitis; case No. 90, absolute 7600, polynuclear 92 per cent., cause general peritonitis; case No. 91, absolute 20,800, polynuclear 90.5 per cent., cause hemorrhage (hæmophilia); case No. 92, absolute 23,200, polynuclear 89.5 per cent., cause embolism.

Of these cases No. 83 and No. 90 were extremely serious clinically, and if conclusions may be drawn from this series, and from the work of others, these cases were serious from a hæmatological standpoint. Case No. 37, both clinically and hæmatologically, should not have been lost, but post-operative ileus developed, and in spite of every effort we were unable to save him. Cases Nos. 41 and 92 died of embolism (clinically). Case No. 71 died of post-operative pneumonia. Case No. 91 died of hemorrhage, which might have been the result of the necrotic action of the infecting organism upon the walls of the appendicular vein, as the blood could be traced deep in the abdominal cavity near the appendiceal site, and as previously stated, no attempt further than simple drainage had been made in this case.

From a hæmatological standpoint, however, the only serious cases should have been No. 83 (absolute 9600, with polynuclear 92 per cent.) and No. 90 (absolute 7600, with polynuclear 92 per cent.).

CONCLUSIONS

The above figures are interesting for they demonstrate:

First, that the absolute count, when taken alone, is of questionable value.

Second, that the polynuclear count alone is, in the great majority of instances, a reliable index in diagnosis.

Third, that the correlated absolute and polynuclear counts are of greater value than either count taken alone, especially as regards prognosis.

A high absolute count with a high polynuclear count means usually good prognosis (*e.g.*, absolute 35,000, polynuclear 95 per cent.). A high absolute count with a moderately low polynuclear (*e.g.*, absolute 30,000, polynuclear 80 per cent.) means usually a very good prognosis. A low absolute count with a high polynuclear count (*e.g.*, absolute 7000, with polynuclear 95 per cent.) indicates a grave prognosis (speaking generally).

A low absolute count with a low polynuclear count means (*e.g.*, absolute 7000 with polynuclear 65 per cent.) usually no infection, or

that the acute condition is due to anatomical or mechanical causes, in other words, that the infection, if one be present, has not stimulated the resisting powers of the body sufficiently to produce a leucocytosis.

Fourth, normal or subnormal figures do not necessarily indicate the absence of suppuration, gangrene or their sequels.

Fifth, catarrhal cases, fulminating cases, moribund cases and walled off abscesses frequently do not stimulate leucocytosis.

TUMORS OF THE GASSERIAN GANGLION

WITH THE REPORT OF AN OPERATED CASE*

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Tumors of the gasserian ganglion have so rarely come to operation that the report of but a single case seems justified together with a review of the literature and the symptomatology. A careful review has brought to light but eight operated cases, Krogius's, Dercum and Keen's, Frazier and Spiller's (2), Giani's, Hofmeister and Meyer's, and Sachs (B.) and Berg's, one of Krause's reported by Hartig. Of these Hofmeister's and Sachs's cases alone had relief. The former died nine months later, but had return of symptoms after four months; the latter died two years later of abdominal metastases. Krogius's case died of meningitis. Dercum's had no relief from pain. One of Frazier's cases lived but a few hours, the other for six weeks. Giani's case died of hemorrhage twenty-four hours later. Krause's was not relieved. Aside from a pathological classification of the observed cases, the tumors may be divided into two anatomical groups; those containing nerve elements and therefore either growing from elements in the ganglion or including it in their growth, and those growing from the dura covering the ganglion and compressing the ganglion but not involving it. This fact is most important in explaining the persistent pain that was noted in our case as well as in several of the others operated upon. Diagnostically these two types are not to be differentiated. A much more valuable clinical classification would seem to be a grouping into early and late cases. The case here reported also died of a recurrence, but I feel convinced that if certain diagnostic features of these cases are recognized, these cases may come to operation still earlier and have permanent relief.

In a careful survey of the literature I have found 21 cases that belong to this group. The cases reported by Trénel, Sternberg, French, Soulier, and Klebs are not tumors that arose primarily in the region of the gasserian ganglion, and are omitted. Two cases of Krause's reported by Hartig also do not belong in this group; one was an aneurism of the internal carotid, the other a tumor starting in the posterior fossa. The case of Soderbergh is also a doubtful one.

Of the 21 undoubted cases the early cases are those of Hofmeister,

*I am indebted to Dr. W. W. Graves and Dr. H. L. Wichmann for following this case with great care after she had left the hospital and procuring an autopsy for me.

Verger and Cardenac, Bezold, Little, Homén, Hansch, Goodhart, Dercum, Keen and Spiller, Dixon, Hagelstam, Krogius, Heslop, Giani, Marchand, Sachs (B.) and Berg. The late cases are those of Hellsten, Krepuska, Spiller and Frazier (2 cases), Blessig, and Gunsburg.

Of those in which the side of the lesion was mentioned apparently all but Hofmeister's, and Spiller and Frazier's occurred on the left side. This fact which seems more than a coincidence suggests that there might be some embryological basis for this, which might throw light on the origin of these tumors, but I have been unable to discover any explanation of this curious fact.

In the late cases the involvement of neighboring areas of brain and cranial nerves is so great that it is practically impossible to differentiate the case from one of tumor in the middle fossa arising from the temporal lobe or some structure adjacent to the ganglion. Even in this group a study of the onset and sequence of symptoms may show that the process started in the region of the gasserian ganglion. The case here reported fits into the group of early cases, and presents what may properly be called the symptom-complex characteristic of this condition.

The history of the case is that in December, 1914, the patient began to have pains along the distribution of the ophthalmic division of the left fifth nerve. This pain gradually spread and two months later involved all three branches and was continuous. At no time was there any cessation of pain. Drugs, climatic condition, local applications in no way influenced the pain. About this time she complained of double vision on looking to the left. Soon after this an impacted molar was removed, but afforded no relief. Some months later her sphenoid and ethmoid sinuses were opened without any improvement in her symptoms. The pain continued without any interruption and with great severity.

In October, 1915, she came to the Neurological Out-patient Department of Washington University Dispensary. Examination showed a well-nourished woman, with intense, constant pain over the entire distribution of her left fifth nerve, paresis of her left sixth nerve, and marked weakness of the motor branch of her left fifth nerve (Fig. 1). Study in Dr. Schwab's service in the hospital showed no further physical signs. The eye grounds were normal; the blood Wassermann was negative. The patient was transferred to the surgical side with a diagnosis of tumor of the gasserian ganglion. We were unable to add anything to Dr. Schwab's study of the case. We could find no evidence of increase of intracranial pressure. No vomiting or eye ground changes. In regard to headache it was difficult to express an opinion, since the pain in the face was so severe. Stereoscopic X-ray plates showed no abnormality and none of the signs of intracranial pressure. No destruction of bone in the region of the middle fossa could be made out. On October 27, 1915, under ether anæsthesia, the approach (Cushing) to the gasserian

ganglion was undertaken. The only difference from the usual procedure was that more bone was removed than usual and the middle meningeal artery was plugged with a wooden peg and cut as it passed through the foramen spinosum. In the region of the ganglion a smooth tumor about the size of a large cherry was exposed, which lay in a cavity in the floor of the skull about 1 cm. deep. It had apparently completely replaced the ganglion. The layer of the dural sheath did not have to be opened, as is customary in operating on the ganglion, so that we evidently were dealing with an extradural tumor. At the time of operation, however, this point was not appreciated. It was supposed the tumor had destroyed the outer dural layer. With great care the tumor was dissected free and in this procedure what were taken to be the third and sixth nerves were exposed on the median side of the tumor. The posterior root was evulsed from the pons so that the opening in the dura through which it passes looked perfectly clean. The tumor (Fig. 2) was particularly adherent in the region of the ophthalmic branch and in separating this last attachment a very severe hemorrhage occurred. Pressure alone controlled this so that two cigarette drains had to be inserted and the rest of the wound was closed in layers with silk. The patient was transfused with 1000 c.c. of her husband's blood. She rallied promptly, but when she became conscious was found to have a complete third and sixth nerve paralysis and a complete motor aphasia with very slight weakness of the right hand. The symptoms were attributed to pressure of the drains, so that in forty-eight hours these were removed. No further trouble was encountered and the wound was tightly closed (Fig. 3). The motor aphasia began to clear up at once and had completely disappeared on the fourth day after operation. The grip was normal on the second day. By the ninth day there was no trace of the third nerve paralysis and the sixth nerve paralysis improved steadily, so that finally a month after operation there was no longer any double vision. After the removal of the drains a left twelfth nerve paralysis and a herpetic blister on the nasopharyngeal side of the soft palate on the left side was noticed. This twelfth nerve paralysis improved, but at her second admission had not disappeared. The herpetic blister disappeared in two days. Another unusual feature and one difficult to explain was that after the third nerve recovered, the pupil which had been dilated (third nerve paralysis) became contracted. The twelfth nerve paralysis was puzzling. If this was due to the escape of some blood into the posterior fossa, why should only the twelfth nerve on that side have been involved and no other nerve? To clear up this point, Dr. C. G. Robinson kindly made electrocardiographic studies and pressure tests on the vagi to determine if they were intact. He could find no disturbance. Possibly the tongue paralysis was a central affair. The blister on the pharynx was merely evidence of the total anæsthesia of the fifth nerve, for it supplies that region of the nasopharynx. The anæsthesia fol-

FIG. 1.—The mark outlines the area of hypæsthesia following operation. The deviation of the mouth was present before operation.

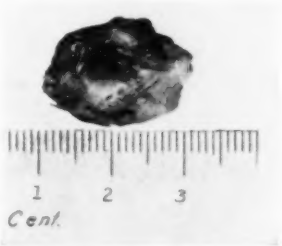

FIG. 2.—Tumor removed at first operation.

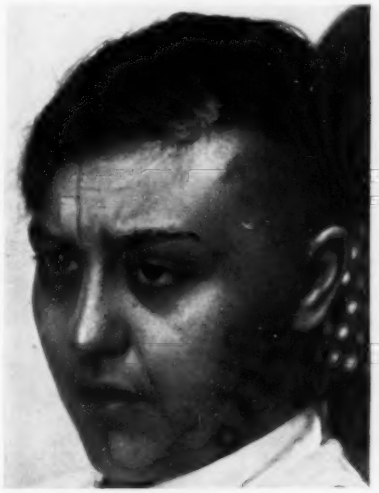

FIG. 3.—The operative incision a week after operation.

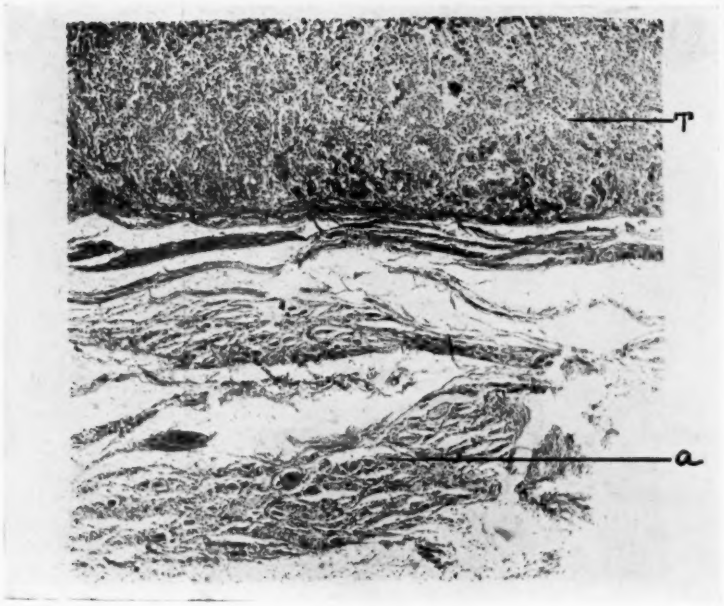

FIG. 4.—Section of edge of tumor and flattened gasserian ganglion. *a*, ganglion cell; *T*, tumor.

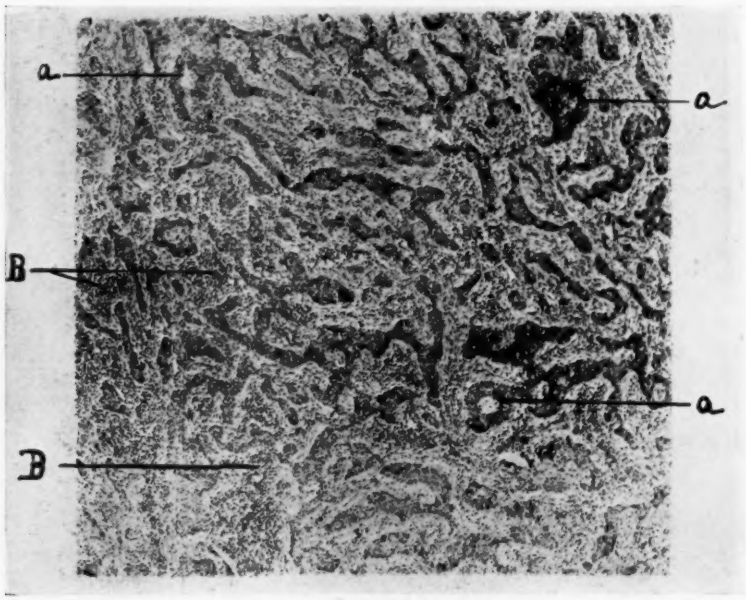

FIG. 5.—Low power of tumor showing nest of cells arranged in alveoli. *a*, lumen in alveoli; *B*, area of round-cell infiltration with plasma cells.

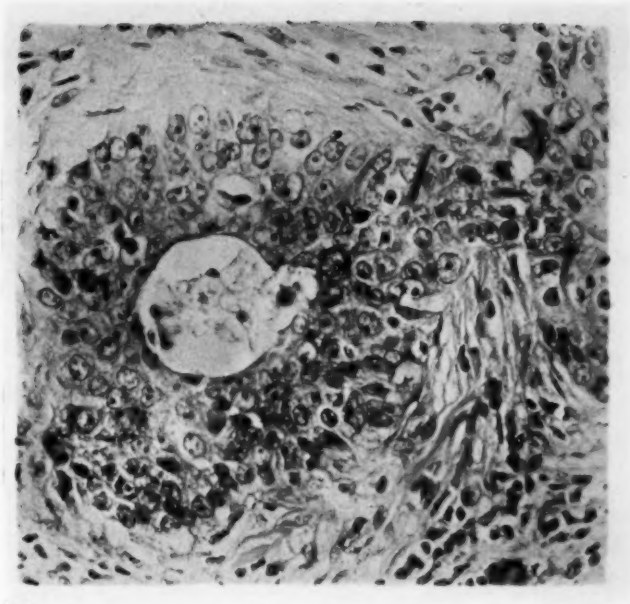

FIG. 6.—High power of one lumen shown in Fig. 5. The nuclei are packed close together and show several nucleoli.

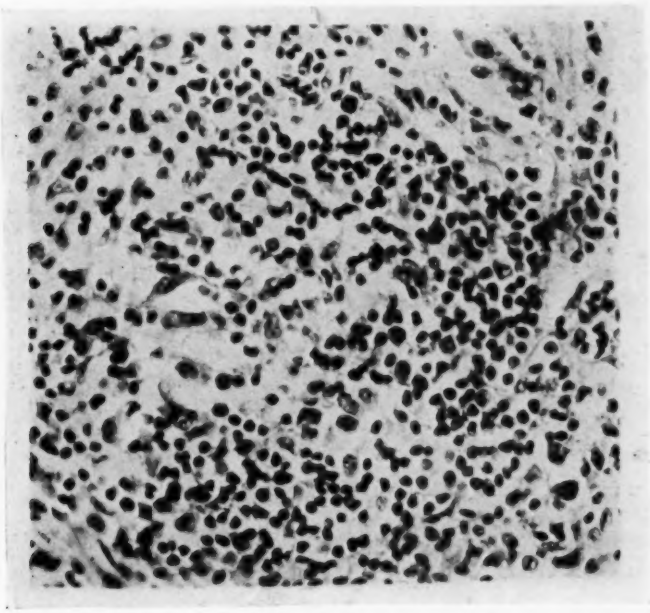

FIG. 7.—Area of round-cell infiltration showing plasma cells.

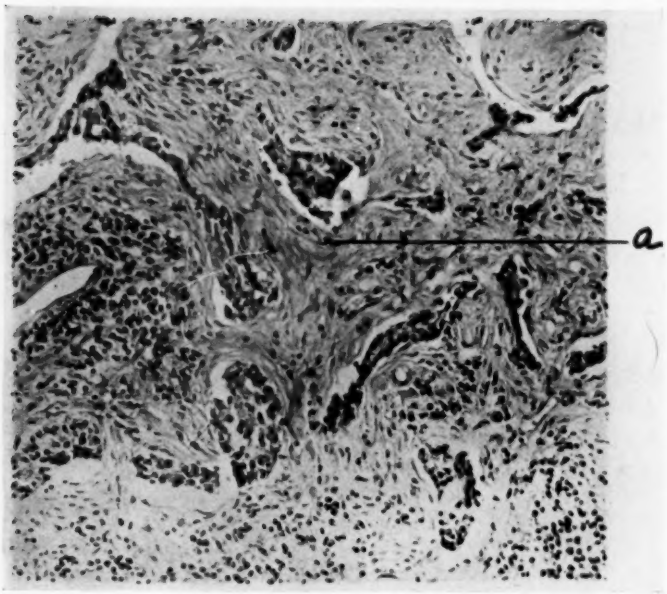

FIG. 8.—*a*, area of coagulative necrosis. This also shows the tendency to form lumina in the alveoli.

lowing the operation was as complete as after the complete evulsion of the sensory root of the gasserian. Serial section of the tumor, however, showed no nerve elements whatever and no structure suggesting the origin of the tumor. The patient was completely relieved of pain and left the hospital about two weeks after her operation.

In about six or seven weeks the patient returned complaining again of severe pains. There still was anæsthesia in the distribution of the fifth nerve, but deep pressure sensation was present. A note in the history at this time read: "There are three possibilities for the recurrence of the pain: First, that the gasserian ganglion being much distorted by the tumor was not seen at the previous operation and a few fibres of the nerve are intact, causing continuance of pain; second, that it is a functional pain from combined causes of operative neurosis and aspirin habit; third, that it is a central pain from organic changes, possible growth of the tumor inwards. It seems wisest to explore in order to be certain that the first and third of these causes are absent."

The subsequent post-mortem examination showed that the gasserian ganglion had been flattened out to mere paper thinness by pressure of the tumor. The opening in the dura through which the posterior root passes from the pons to the ganglion appeared entirely empty, but on careful microscopic section a few flattened nerve fibres were found on the upper inner edge of this aperture (Fig. 4, *a*).

The patient was readmitted on February 10, 1916, and physical examination showed the same condition as at discharge three and one-half months before. The twelfth nerve paralysis was still present. On February 12, through the previous incision, the tumor was again attacked, but was found quite unoperable. A small piece was removed for diagnosis and showed the same histological picture as the original tumor.

The patient left the hospital on February 23, unimproved. She suffered intensely and was kept tolerably comfortable with large doses of morphine. Shortly after the second operation her cervical glands began to enlarge. She became fearfully emaciated. About ten days before her death she lost the sight of her left eye and died on September 15, 1916.

The two conditions which may be mistaken for this condition are tic douloureux and sphenoidal sinus disease. In true tic douloureux, the pain is never persistent or continuous, but it is intermittent in character and comes in spasms. The patient has periods of relief of varying lengths of time. External stimuli may influence the severity of the pain and external applications of heat or some drugs may bring temporary relief.

In true tic douloureux one never sees any cranial nerve palsies.

In sinus disease, the pain may be persistent and of the same character as in ganglion tumor, though never, I think, as severe or excru-

ciating; there may be involvement of the abducens nerve, though this is unlikely, but it is quite impossible ever to have involvement of the motor branch of the fifth nerve since anatomically it is too far from that region.

Severe continuous pain in the distribution of the trigeminus with paresis of the motor branch of the fifth nerve justifies at once the diagnosis of tumor of the gasserian ganglion. I do not believe it is necessary to wait, however, until the motor branch of the fifth nerve is involved. As soon as an infected sinus has been excluded the persistent pain as distinguished from the intermittent spasmodic pain of tic douloureux justifies an operation on the ganglion on the suspicion that a tumor is present.

A considerable number of these tumors have been studied pathologically. In the last fifty-two years the literature contains 37 cases. These have been reviewed with particular care as to their pathology by Marchand and Giani. Though various diagnoses have been made in these cases, varying from carcinoma to sarcoma and endothelioma, the consensus of opinion has been to call them endothelioma. It seems probable that at least some of the cases called carcinoma belonged to the endotheliomata.

The salient features that Marchand emphasied are a reticulum of connective-tissue fibrils which seem to be part of the dural covering of the ganglion. Scattered through this are round or polygonal epithelial-like cells with clear homogeneous transparent cytoplasm. In places the growth looks like a large round cell sarcoma but in many places like a malignant epithelial tumor. At times there is acinar formation. These facts, together with the peculiar relation to the ganglion cells, led Marchand to think that these cells might be identical with those lining the capsule of the ganglion cells and also the cells of the sheath of Schwann. If this is correct, the tumor would be an endothelioma. Further study raised the question in Marchand's mind whether the tumor had not originated in the undifferentiated stage of the ganglion anlage, and if that were so the tumor should be called a "Neurozytoma." Giani's description adds nothing new. His case was complicated by tuberculous lesions in the tumor.

Our tumor on inspection appears well encapsulated, but on section there is one portion where the growth evidently was not completely removed. The first impression on looking at the section is that we are dealing with a carcinoma (Fig. 5). The sections of the tumor removed at operation and at the subsequent autopsy show the identical processes, but, as will appear later, ganglion cells were only found in the autopsy specimen.

The tumor removed at operation was cut in serial sections and stained with hæmatoxylin and eosin, van Gieson, Pal Weigert and polychrome methylene-blue. The serial sections of the tumor showed nowhere any ganglion cells. The tumor is composed of a loose reticu-

lum of connective tissue interspersed with many lymphatic channels and a moderate number of capillaries. Scattered throughout this mass are nests and strands of cells which are arranged in alveoli. These alveoli form anastomosing columns of great complexity. They are composed of cells whose outlines are determined with much difficulty. At times they resemble a mass of syncytium, but in other places the cell outlines are quite well defined. The cytoplasm is finely granular and vacuolated. Although most of the alveoli are packed solidly with cells there are a few in which there are rounded spaces and sometimes a definite round lumen in which there lies some granular material. There are numerous nuclei closely packed together which are round or oval and vesicular and contain one or two darkly staining nucleoli. The cells have not the sharply defined outline and regular rounded nuclei of epithelial cells. There are no intracellular bridges.

Scattered through the connective-tissue stroma are areas of round-cell infiltration with numerous plasma cells. These are grouped around blood-vessels.

There are areas in the specimen of rather homogeneous masses which take the eosin stain diffusely and evidently are coagulative necrosis (Fig. 8). What the significance of these areas is or what their relation to the tumor proper, it is not possible to decide.

The sections of the tumor taken at autopsy show the same characteristics, but the cells vary more in size and show more evidence of mitosis. These sections show at their margins the frayed-out remnant of the gasserian ganglion (Fig. 4). It is remarkably compressed; at its broadest diameter it measures but .35 millimetre. This marked thinning explains why its root was not seen at operation. The nerve cells without exception show degenerative changes; many of them have no nuclei and the Nissl bodies either do not stain at all or are very abnormal. In some cases the Nissl bodies are gathered in a small mass about the nucleus. These cells are atypical in form and are flattened, showing the effect of prolonged compression. There is evidently also a very marked diminution in the number of these cells. There are some empty spaces in which ganglion cells had been lying but no trace of the cell remains.

In deciding on the nature of this tumor several points have to be considered. In the first place, this tumor arose in a region where there is no epithelial tissue, and from the intimate attachment of the tumor to the dura in the region of the cavernous sinus as found at operation it is fair to assume that this is the origin of the tumor. A comparison of this tumor with those published by Marchand, and Giani and Spiller [1] shows a striking resemblance. We feel justified therefore in calling it an endothelioma.

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[1] Through the kindness of Dr. W. G. Spiller, I have had an opportunity of studying the section of one of his cases which is identical with mine. I have also examined sections of Dr. B. Sachs's case (removed by Berg) and this seems to be a sarcoma.

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BONE TRANSPLANTATION FROM SCAPULA FOR DEFECT IN SKULL

By Bert Logan Jones, M.D., C.M.
of Walla Walla, Washington

Patient "H," aged twenty-six. For the past four years had suffered from attacks of confusion, occurring about once a month, due presumably to a defect in his skull, due to traumatism at the age of four years. Examination shows absence of bone protection over an area of approximately 3 cm. by 5 cm. in the left frontal region (Fig. 1).

Inspection showed marked pulsation. During attacks of confusion there would be marked bulging over the area. Patient was rational but lacked energy to carry out any line of work.

Fig. 1.—Showing defect in skull to be filled by transplant from the scapula.

May 25, 1916, a piece of the left scapula was first removed (Fig. 2) and placed in a saline solution. The piece was slightly larger than the opening of the defect in the skull. The incision was closed.

A flap was then turned down and dissected from its adhesions to the dura mater, exposing the skull defect. The piece of scapula was then placed in the opening of the defect, and its periosteum and the periosteum of the skull sutured. The flap was replaced without drainage.

Post-operative Course.—There was one marked convulsion on the morning following the operation. Aside from four slight attacks at lengthening intervals, the recovery was uneventful. Patient left hospital October 9, 1916.

FIG. 2.—Showing portion of scapula removed for transplantation.

Part being firm, bone-reunion apparently has taken place. The patient's mental and physical condition was markedly improved.

The scapula was used for the reason that it was a flat bone and was covered with a periosteum.

The accompanying drawings show the location of the defect and the region of the scapula from which the piece of bone was taken.

THE VALUE OF BONE AND CARTILAGE TRANSPLANTS IN RHINOLOGICAL SURGERY*

By William Wesley Carter, M.D.
of New York City

In bringing this subject before you my chief object is to show, by the radiographic history of certain cases that I have operated, the true value and permanent qualities of bone and cartilage as a transplant in the correction of nasal deformities and defects due to the destruction by disease and traumatism of the bony and cartilaginous framework of the organ. My observations are drawn from a close clinical and X-ray study of some of my oldest cases.

I began this work over eight years ago, and having transplanted bone both with and without periosteum, with and without contact with the living skeletal bones, I feel that a sufficient time has elapsed to enable me to say that these cases show accurately the history of autogenous bone and cartilage transplants in the human body. I may state further that this procedure, having been subjected to the crucial and ultimate test of application to a number of human subjects, and the results having proved satisfactory, I feel that I may confidently advocate its use both from a scientific and practical point of view.

Animal experimentation is of great assistance in the development of ideas, and it enables one to reach conclusions approximately correct as to the value of surgical procedures when practised upon the human subject. The results obtained by the vivisectionist, however, must be verified by the supreme test of application to the human body. In the case of bone transplantation no statistics as to the value of the periosteum, the vitality of the transplant, its absorption or non-absorption, etc., obtained by animal experimentation, could be applied to this operation on the human subject for the reason that in the case of lower animals it is practically impossible to secure and maintain asepsis or to keep them quiet until the healing process is complete. Infection, even if it does not cause the transplant to slough out, exerts a marked influence on the vitality of the graft. A certain amount of motion increases osteogenesis in the live, skeletal attached bones after injury, but upon the transplant itself it has the opposite effect, since it has been suddenly cut off from its normal blood supply. It must be remembered that the primary newly-developed capillaries which supply the transplant with blood in its new position are extremely delicate (their walls consisting of only one layer of cells) and that they may be destroyed by the most trivial traumatism. This would

*Read before Bellevue Hospital Alumni Society, New York City, and American Academy of Ophthalmology and Oto-Laryngology, December 12, 1916, Memphis, Tenn.

at least cause a delay in the healing in of the transplant, if not its death and subsequent expulsion. It will be seen, therefore, that while conclusions may be drawn which apply to the animal itself under the conditions which animal experimentation must be done, these results can scarcely be considered as furnishing more than presumptive evidence as to what will happen when bone is transplanted in man, or at least statistics as to the fate of the transplant, the value of the periosteum, etc., in animals would be inaccurate when applied to man, where conditions are different and where rest and asepsis can be easily obtained. Another element of greatest importance is time. Bone is a tissue comparatively slow in its metabolic processes, therefore a considerable space of time should elapse before we can estimate with any degree of accuracy the final results and the ultimate disposition of the transplant in the tissues. Where the animal is killed a few days after the operation, no reliable data can be obtained and statistics based upon such experience throw no light upon the science of bone transplantation. Almost any foreign body introduced into the body under aseptic conditions can be made to heal in, and it may remain for a long time, but sooner or later it will be expelled, especially if it has resistance to overcome. For this reason no foreign substance can be used successfully to elevate a sunken nasal bridge, for here it is subjected to constant pressure due to the elasticity of the skin. In freshly removed bone and cartilage, on the other hand, we have a live connective tissue capable of being transplanted into another part of the body without losing its vitality, and where it may be used to replace bone and cartilage that has been destroyed by accident or disease.

The interesting question arises as to what part the transplant plays in the process of repair, and what may be the influence of the periosteum, and what are the relations between the transplant and the surrounding tissues. To determine this a considerable time must elapse after the operation. The cases of my series which I have carefully studied with a view to determining these matters are of long standing and show in the serial radiographs very clearly what has taken place. It is my belief that the contradictory conclusions reached by different writers upon this subject are due to differences in the methods of operating, in the anatomy of the parts operated upon, in the site of the operation (allowing for mobility or fixation during healing), in the presence or absence of infection, and in the time that has elapsed since the operation. Reliable data can be obtained only by studying the progress of a number of cases after the ideal operation. By ideal operation, *I mean where an autogenous transplant has been introduced aseptically in a position in the human body where perfect immobility can be secured.* No part of the body is better adapted for securing these conditions than the nose. In addition, the abundant

blood supply to the organ insures to the transplant a maximum of nutrition and resistance to infection.

My work in this field has been confined to transplantations into the nose, with the exception of one case, in which the bone was first transplanted into the arm and then the flap containing the bone was later transferred to the face. This was in a case where the patient had no nose.

Sixty-one cases are included in my series. A number of these have been kept under close observation and have from time to time been X-rayed and at intervals they have been brought before the Laryngological Section of the New York Academy of Medicine for observation and comment. I do not consider a case of less than a year's standing old enough to furnish data of any value in determining final results.

It is not my purpose on this occasion to dwell upon the cosmetic results secured in my work. I will say, however, that no case has been rejected on account of its severity and that some of my cases have been most difficult. In degree of deformity they have ranged from slight depressions, easily corrected by the transplantation of a spur or portion of a deflected septum removed at the time of the operation, to absence of the entire nose. In many of my cases where the deformity was very great and there was no bony framework left in the nose, my only expectation at the first operation was to raise the bridge of the nose to a moderate degree, my chief object being to establish a bony foundation securely anchored to the frontal bone upon which to build up a nose by the transplantation of more bone and cartilage at some later date. In one severe case I constructed a V-shaped pier from two strips of bone and upon this was placed the long dorsal strip; the result in this case was very satisfactory. In others several strips of bone were superimposed. In these cases only the outer strip was periosteum-covered. These cases show distinctly the influence of the periosteum on the growth of the transplant.

In estimating the value of my methods from a cosmetic point of view, therefore, one must take into consideration the fact that a majority of my cases were extreme deformities. I will say that the results have been excellent in many of these, and in others the improvement is marked. In none has the deformity been increased. I can state positively that I know of no other method for the correction of this class of deformities so efficient as that of bone and cartilage transplantation.

The following were etiological factors in my series of cases: Congenital defects and malformations, traumatism, syphilis, tuberculosis, atrophic rhinitis, the submucous operation and abscess of the septum.

Logically and practically the use of the patient's own tissue for transplantation, the autoplastic operation, is the best method. Here, as I stated in my first communication on this subject, there is no incompatibility between the elements of the transplant and those of the

receiving tissues; for the arrangement of the atoms in the molecule of the two is the same. We have therefore in the wound serological conditions most favorable to immediate healing, which is especially desirable in the transplantation of bone.

I have used bone from another patient on only two occasions, and both times the transplant had to be removed; in one seven days, and in the other ten days, after the operation. I will say, however, that in both instances the wound was infected, so that the failure of the graft to take could scarcely be attributed to serological differences between the transplant and the receiving tissues.

The use of tissue from an animal of a different species, the heteroplastic operation, I have never tried, as I believe that only the best known methods should be applied to the human subject. Many such operations have been reported, but the success of these does not compare with that of autoplastic transplants. Heteroplastic transplants are always absorbed.

I will admit that my early work in this field was largely experimental, but the cases selected were so badly deformed that I knew no injury would be done even if the transplant had to be removed. The hypothesis upon which I began this work was, that bone is a form of living connective tissue, and that a fragment removed from one part of the body and transplanted aseptically into another part of the same body would retain its vitality, being first nourished by the serous pabulum which surrounds it, and later by a network of new capillaries developed from the surrounding tissues. This view was contrary to the belief held at that time by histologists, anatomists and pathologists who believed that a bone transplant was dead tissue, and that it was always absorbed and that new bone was deposited in its stead. My series of carefully observed cases, some of several years' standing, shows that the original transplant is not only not absorbed, but that it lives, takes part in the local processes of repair and grows, its growth being subject to the law of functional adaptation. It proves, contrary to the belief of some pathologists, that mature bone is not a dead tissue, but like other tissues undergoes metabolism throughout the life of the individual.

Murphy's view that transplanted bone is merely osteoconductive is altogether at variance with the results shown in these cases.

Nasal deformities naturally fall into two groups: (1) Those cases in which the deformity is due to a dislocation of the anatomical structures of the nose. These may be corrected by the local transposition of tissue, by the use of the bridge-splint and by various mechanical devices. (2) Those cases in which either from accident or disease there has been an actual destruction of the bony and cartilaginous framework of the nose. These cases may be further complicated by more or less mutilation or destruction of the soft parts and by cicatricial contraction.

Cases belonging to this second group come under our present consideration and may be corrected by the transplantation of bone and cartilage.

I have found the rib well adapted for this purpose. It is well supplied with nutrient foramina, it is properly shaped, it is easily accessible and the removal of a section causes the patient little or no inconvenience. The defect is quickly filled in by bone developed from the stumps of the rib. The end of the rib with a portion of its costal cartilage is the part used. This enables me to repair the bony portion of the bridge with bone and the cartilaginous with cartilage. Thus establishing normal conditions as nearly as possible and preserving the flexibility of the nasal tip.

The operation by the external route is briefly as follows: The nasal cavities are cleansed with Dobell's solution. The eyebrows are covered with flexible collodion, after thoroughly scrubbing the entire face with green soap and water, followed by alcohol. The nose and adjacent portions of the face are then painted with tr. iodine. The right side of the chest is prepared in the same manner. No antiseptic is used after the first incision. I use only freshly sterilized physiological salt solution.

A curvilinear incision, convexity downward, is made between the inner extremities of the eyebrows. This incision extends down to the periosteum. With a spatula-shaped knife, slightly curved, and having three cutting edges, I then elevate the tissues over the dorsum of the nose down to the tip, and if the deformity is very great over the sides as well. If the nasal bones are present, I keep as close to them as possible, endeavoring to strip up the periosteum. After elevating the tissues over the nose, I lift up the semilunar flap made by the first incision and make a horizontal incision through the periosteum into the frontal bone. Care is taken to cut deeply into this bone in order to excite osteogenesis necessary to bind the end of the transplant to this bone. The so-called periosteum over the frontal bone is not an osteogenetic membrane and it serves our purpose in this instance merely to hold the end of the transplant in position.

I next proceed to resect about two inches of the ninth rib. This segment is taken from the end of the rib, and consists of two-thirds ribs and one-third costal cartilage. The periosteum on the anterior surface of the transplant is preserved. The segment removed is split and the outer half which is covered by periosteum is shaped to suit the deformity. It is then placed in the bed prepared for it in the nose; the cartilaginous end reaching nearly to the tip and the upper end being securely tucked under the periosteum in close contact with the frontal bone. The semilunar flap is then brought down into position and the wound closed with horse-hair sutures.

This external operation is probably better suited to the very severe cases, especially where there is much scar-tissue, than the intranasal method which I shall presently describe.

No effort is made to expel the blood-clot which fills the wound made in elevating the tissues over the nose, for this temporarily nourishes the transplant and later favors osteogenesis.

No manipulation of the part should be permitted, and the case should not be exposed to the X-rays until the transplant has become fixed in its new position and we are quite sure that its vascular connections have been established. On three occasions an early X-ray exposure (the ninth or tenth day

FIG. 1. FIG. 2.

FIG. 3. FIG. 4.

FIGS. 1–4.—Traumatic deformity corrected by intranasal transplantation of conjoined bone and cartilage.

FIG. 5.—Congenital deformity corrected by superimposing three fragments of bone. Intranasal method.

FIG. 6.—Pier operation for congenital deformity.

FIG. 7. FIG. 8.

FIGS. 7 and 8.—Traumatic deformity corrected by intranasal transplantation of conjoined bone and cartilage.

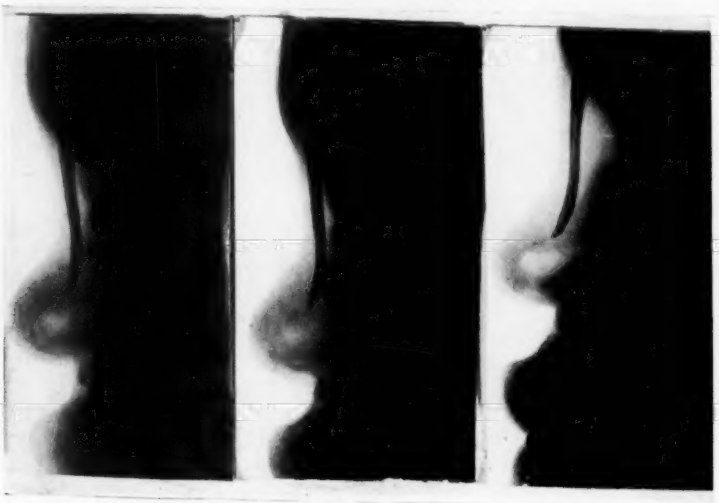

FIG. 9.—Congenital deformity. Periosteum covered transplant seven months after operation.

FIG. 10.—Same case as Fig. 9, twenty months after operation.

FIG. 11.—Same case as Fig. 9, two years and four months after operation. Note thin line of absorption in centre of transplant.

FIG. 12.—Same case as Fig. 9, three years after operation.

FIG. 13.—Same case as Fig. 9, four years after operation.

after the operation) seemed to interfere with the healing process: within forty-eight hours after the exposure to the ray there was a slight non-inflammatory bulging at the site of the incision. An opening was made and there was a slight discharge of serum, there was no pus formation and the cases progressed satisfactorily afterwards. I may have been mistaken in attributing the disturbance to the X-ray, but the clinical connection seemed to be so evident that I have been careful since this time not to expose the patient to the rays too soon after the operation.

Recently I have ceased to use the external route for the introduction of the transplant save in the very marked and difficult cases.

Operation by the Internal Route.—In this operation the transplant is prepared as I have just described. The left nasal cavity is sterilized and the tip of the nose is raised with the left thumb. The spatula-shaped knife is introduced through the roof of the nasal cavity at a point corresponding to the interval between the upper and lower lateral cartilages. Through this opening the tissues over the dorsum of the nose are elevated and a pocket is made towards the tip. The transplant is introduced, then by pulling on the tip of the nose the lower end is slipped into its pocket near the tip. No suture is used to close the wound as the edges naturally fall together. The nostril is packed with vaseline gauze for twenty-four hours.

This method in suitable cases is far preferable to the external route, as the wound is at the lowest point of the submucous sac and thus drainage is facilitated. There is no external scar, and in my opinion there is less danger of infection; for it must be remembered that the normal nasal secretions inhibit if they do not actually destroy bacterial growths.

In the cases I have done by the intranasal route the results have been excellent, the swelling has been less than by the external method and there have been no cases of infection.

If the deformity is marked, several fragments of bone may be superimposed. This is preferable to using one large fragment, as small transplants possess relatively greater osteogenetic power than large ones.

In cases of moderate deformity, where there is a septal spur or deflection, this may be removed by the submucous operation and transplanted into the bridge of the nose by the intranasal route. I have on several occasions used septal cartilage removed from another patient, in closing a perforation of the septum. In these cases the cartilage seems to serve as a bridge for the mucous membrane.

Operation for collapsed alæ due to loss of muscular tone.—The following procedure which I have used only once proved so efficient in relieving a patient of this very annoying condition, I feel that I am justified in describing it: With a very sharp scalpel both alæ were split their entire length to the depth of about three-eighths of an inch. Two thin curved strips of cartilage were then introduced and the wound closed with horse-hair sutures. The nostrils were kept distended with vaseline gauze for several days. When healing was complete the openings were considerably larger and the patient was entirely relieved.

Time will not permit me to describe the interesting cases that have come under my observation, and the cosmetic results secured by the transplantation of bone and cartilage. The chief object of this presentation is to call your attention to the value of bone and cartilage as a constructive material, and to demonstrate by serial X-ray plates that the vitality of this tissue, when properly transplanted, is not im-

paired but that in its new position it lives and grows, its growth being limited by the functional demands of the part.

The following conclusions are based upon my interpretation of the clinical and X-ray evidence presented by the cases that were operated upon from three to five years ago: Bone and cartilage present about the same vitality and resistance to infection.

Infection occurring in the wound does not necessarily mean the destruction of the entire transplant, if the infection is quickly controlled. But a part at least of the transplant will be absorbed.

A transplant stripped of its periosteum, and placed in the soft tissues of the nose, remains alive and is not absorbed, but it does not exhibit the vigorous growth noted in the periosteum-covered transplants.

Bare bone contacted with live, periosteum-covered bone is osteoconductive and osteogenetic and is not absorbed. Periosteum-covered transplants contacted with live periosteum-covered bone continue to live and perform their function uninfluenced by their change of position in the body. This is the ideal transplant for use in all the departments of surgery.

The periosteum, *per se,* does not reproduce bone.

I must conclude, therefore, that while the periosteum is necessary to the vigorous growth of bone, the bare compact bone takes an active part in the production of bone.

In closing I may add that in bone and cartilage transplantation I believe that we have an aid which will prove of great value in solving some of the difficult problems which confront us in rhinological surgery.

FACTORS BEARING ON THE MORTALITY IN OPERATIONS FOR BILIARY OBSTRUCTION BY CALCULUS*

By Frederick T. van Beuren, Jr., M.D.
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It is easy, of course, to understand why operations for common duct obstructions show a higher death-rate than those for stone in the gall-bladder. In the former case we have to do with a condition that is almost certainly of long standing, a disease whose product has deprived the organism, for its useful purposes, of the proper secretion of its largest, and, in some cases, of its two largest glands; and has forced them, commonly speaking, to stew in their own juice. Add to this the possible distant effects, on the tissues, of resorbing these secretions; keep in mind the fact that certain chemical combinations which may be poured harmlessly through the alimentary tract, are decidedly poisonous on direct introduction into the blood stream; and one cannot but agree that, contrasted with a stone blocking the common duct (especially at its duodenal terminus), a gall-bladder full of nicely polished calculi is more or less comparable to a pocket full of cherries. Barring infection and impaction it is apparently no less comfortable and only potentially more dangerous to the owner.

In this analysis, however, we are concerned not with the relative danger between operations upon the gall-bladder and operations upon the common duct, in general, but rather with the relative danger between our operations and those of others upon cases supposably similar. And any attempt to determine this relation must take under consideration those special factors which others have said to be, or which we ourselves have come to look upon as, probable determinants of a fatal issue. Among these are (1) the age, (2) the general condition of the patient, (3) the duration and severity of the symptoms for relief of which he was operated, and (4) the question whether the operation was done during one of the attacks or in the interval between; (5) the difficulty and the consequent length of the operation and the traumatization of the tissues must also be considered; (6) drainage of the bile passages must be noted, and (7) complications must be carefully scrutinized to determine whether they were avoidable or not. And when we have done all this we shall be in a position to make at least a fair guess why the patient died.

In examining the records of the following cases I must explain that I did not see these operations and that criticisms which I have appended in three instances may not be justified.

The records are those of nine cases that died after operation for

*Read before the New York Surgical Society, February 28, 1917.

calculous obstruction of the common bile-duct at the Roosevelt Hospital during the years 1910–1914, inclusive.

In this same period there we had a total of thirty-four such operations, so that our mortality seems extraordinarily high when compared with the Mayo Clinic, 8 per cent. (Collected Papers by the Staff of St. Mary's Hospital, Mayo Clinic, 1911), and Erdmann's, 8 per cent. ("Biliary Surgery," John F. Erdmann, ANNALS OF SURGERY, December, 1914), mortality in common duct operations.

CASE I.—The first of these nine cases (A268) was a feeble old man of seventy-two years, in poor general condition. He had had his first similar attack twenty years previously, and had been free for eighteen years. The present attack had begun recently and was progressing with acute pain, chills and fever, increasing jaundice, temperature 102° F., pulse 90, respirations 24, white blood count 35,000 (polymorphonuclears 84 per cent.). In his case operation was delayed thirteen days in the hope of improving his condition; but acute symptoms were still present at this time and the operation was extremely difficult. The common duct was found packed full of stones and a putty-like mass and the obstruction was complicated by cholangeitis, chronic pancreatitis and a spontaneously-formed fistula between gall-bladder and duodenum. The duodenum had to be opened and sutured, cholecystectomy was performed and drainage secured into the upper part of the common duct. He developed signs of pneumonia on the second day after operation and died on the sixth, apparently of pneumonia. If the cholecystduodenal fistula could have been left undisturbed the operation would have been shortened and some trauma avoided.

CASE II.—An elderly man (A1431) over fifty (exact age unknown), in fair general condition. His first similar attack of pain had occurred twelve years before admission and, following several similar attacks three years later, he had discovered gallstones in his stool. A long free interval had intervened, but he had had renewed attacks in the three years previous to admission; the last, with chills and fever, five days before. He still had some tenderness and rigidity and a white blood count of 23,000 (86 per cent. polymorphonuclears), although his temperature was only 99.6° F., his pulse 76 and his respirations 20. The operation included cholecystectomy of a large gall-bladder containing *Bacillus coli* and many stones, and drainage of the common duct by tube, through the cystic junction, after removing two calculi. His temperature had reached normal on the eighth day, and his convalescence seemed well established, but a hernia was noted (in the scar) which necessitated operative interference on the eleventh day after his choledochotomy, the sutures in the rectus sheath having suddenly given way. His temperature reached normal on the third day after his second operation and remained so till the

sixth day, when he had a sudden rise to 105° F. and died the next day with a temperature of 107° F., without signs of pneumonia or peritonitis. It may of course have been the overwhelming toxæmia of a pneumonia that allowed no time for signs to develop.

CASE III.—A woman (A1983) forty-seven years old, very acutely ill, whose general condition was unfavorable, due to marked adiposity and a distinct chronic nephritis. Her trouble had begun eight years before with pain and jaundice and had been more or less continuous. The attack which brought her in to us had begun only a day or two previously and she had been jaundiced for twenty-four hours, was suffering severe, constant pain, had temperature of 106.8° F., pulse 124 and respirations 44. Her white blood count was only 7000 (89 per cent. polymorphonuclears). Immediate operation was undertaken and proved long and difficult (1 hour 45 minutes), for her gall-bladder, which was small and indurated, was closely adherent to the duodenum and had ulcerated partly through its wall, while the hepatic and common ducts were enormously dilated and packed with forty stones of ⅛ to ¾ inch in diameter. Operation failed to relieve this woman and she died on the second day after operation, with high temperature (106.4° F.) and rapid respirations (48 per minute) but without frank signs of pneumonia. Considering her high temperature and rapid respiratory rate on admission we might (except for the low white blood count) believe that she had pneumonia before her operation; but, without other clinical signs, it is not possible to say whether the toxæmia that overwhelmed her had its origin above or below the diaphragm.

CASE IV.—A man (A2120) fifty-nine years old, who had formerly been a very heavy drinker and whose liver was tremendously enlarged, with its free border four inches below the costal margin. His general condition was further reduced by a well-marked chronic nephritis. Attacks of pain similar to the present had begun two years before and the present attack had started about three weeks prior to admission, with sharp pain for twenty-four hours, followed by dull aching, and jaundice appearing thirty-six hours after the onset of pain. This was his initial attack of jaundice and was still present, though not increasing, at the time of operation. His temperature ran from 100° to 103° F., his pulse about 80 and respirations 20. His white blood count was 12,000 (87 per cent. polymorphonuclears). By a transduodenal choledochotomy a large calculus impacted in the papilla of Vater was removed together with multitudinous small calculi that lay above it in the duct. The duodenal wound was sutured and the abdominal wound closed around a cigarette drain. The operation took only forty-five minutes and presented no special difficulties and is the only one of this group that did not provide for external drainage of the common duct. His obstruction was relieved and his wound healing progressed satisfactorily, but, on the third day after operation, his temperature rose again, signs

of consolidation appeared over the left lower lobe and spread progressively until his death (with pulmonary œdema) on the eleventh day after operation, apparently, of pneumonia.

CASE V.—An elderly woman (A2802) over fifty years (exact age unknown), in poor general condition from a chronic cardio-nephritis with a blood-pressure of 170–210. She had symptoms of gall-stone trouble for many years, but this operation may fairly be called an "interval" one. A shrunken gall-bladder with minute calculi was removed and several soft calculi were extracted from the hepatic and common ducts through an incision in the dilated common duct, which was drained as usual. After operation, persistent vomiting with suppression of urine and signs of cardiac dilatation appeared and she died on the second day after operation, apparently of cardiac failure.

CASE VI.—An emaciated young man (B922) of twenty-six years, in bad general condition, convalescing from an operation for opening an abscess in the gall-bladder region one month before. He had lost thirty pounds in the preceding six months, had been jaundiced for five months, and had had his gall-bladder drained two months before his admission. At the time of his admission he was still jaundiced and was having diarrhœal, clay-colored stools containing free fat. His temperature ranged between 99° and 104° F., his pulse from 92 upward and respirations 24. His white blood count was 21,000 (82 per cent. polymorphonuclears). His operation was exceedingly difficult, lasting one hour and twenty minutes, removed fifteen calculi from the junction of the hepatic ducts and discovered an inflammatory mass with small abscesses in the liver, pus in the bile, a hard mass in the head of the pancreas and a stricture of the common duct about 2 cm. above its duodenal terminus. It is not stated that operation relieved this stricture, but the common duct was drained by the usual rubber tube. The bile contained *Staphylococcus pyogenes aureus*. This poor fellow hung on to life for three weeks, in spite of persistent diarrhœa and increasing weakness. His jaundice had almost completely disappeared and bile had appeared in the stool on the seventh day after operation, but his temperature continued high and he died, apparently of asthenia, on the twenty-second day after operation. Autopsy revealed that he had tuberculosis of the peritoneum as well as his other lesions. The masses in his liver and pancreas were chronic inflammatory tissue.

CASE VII.—An emaciated male (B1293) of forty-five years. He had the look of chronic illness and a definite tuberculous lesion was evident at his right apex. He had had recurrent attacks of pain and jaundice for three years, chills and fever and an enlarged spleen. His symptoms were not acute at the time of the operation, which removed one large calculus from just above the pancreatic portion of the common duct together with many small ones from the gall-bladder and drained both with rubber tubing. His post-operative course was stormy, with distention

and vomiting. Signs of pneumonia developed, his white blood count rose steadily, his temperature remained up, and, in three weeks after operation, the patient vomited bloody fluid and had a bloody discharge from the wound which had not closed. On the twenty-ninth day, an exploring needle, in the eighth costal interspace, revealed pus. A subphrenic abscess containing Gram-negative bacilli was immediately drained, but the patient failed to rally and died on the thirty-first day after operation, apparently of weakness due to sepsis and pneumonia.

CASE VIII.—A woman (B1873) of forty years who looked very acutely ill, with rapid, shallow respirations. She had suffered from "indigestion" for four or five years, but had never had an attack like the present and had never been jaundiced. The present attack had begun several days before admission with vomiting and severe colicky pain, which had become slight during the last eighteen hours. She had a tender mass in the right upper quadrant of the abdomen with well-marked muscular spasm. Temperature 104° F., pulse 120, respirations 28 and white blood count 10,000 (72 polymorphonuclears). She was the only case of the series without jaundice and her obstruction was evidently of very recent origin. Immediate operation disclosed an abscess containing five ounces of pus lying to the inner side of a small, thickened gall-bladder surrounded by dense adhesions. Two large stones (which lay below the cystic and one and one-half inches apart) were removed from the common duct together with much fine gravel and thickened bile from the hepatic and cystic ducts. Typhoid bacilli were cultured from the pus around the gall-bladder. After operation her urine was free from bile on the second day, but signs of beginning consolidation in the lower lobe of the right lung appeared, her temperature rose gradually to 106.8° F., and she died on the fourth day, apparently of pneumonia and sepsis. This woman might have had a better chance if her abscess had been drained and the duct operation delayed to give her a chance to get up resistance (as in Case B1393—a nephritic in poor condition, who had her gall-bladder drained and recovered so well as to undergo two successful choledochotomies within six months afterward).

CASE IX.—A woman (B4449) of sixty-eight years, in bad general condition. She had had similar attacks four years before, relieved by cholecystostomy, and a free interval till ten months previous to admission. Since that time attacks had been frequent, she had been continuously jaundiced and had lost thirty-one pounds. At the time of her operation she still had pain and jaundice and a tender mass in the gall-bladder region, but her tempertaure and white blood count were within normal limits. The operation was long and difficult on account of mass adhesions, including the removal of a distended gall-bladder infected with *Bacillus coli* and *Bacillus typhosus* and the removal of a calculus from the common duct and drainage of the latter.

The patient left the operating table in poor condition and died six hours later, apparently of operative shock. It is just possible that this woman, also, might have done better with a preliminary removal of the gall-bladder with cystic duct drainage and (providing she survived that) a secondary operation on the common duct.

A review of these data makes it appear that—

1. *Age* cuts little figure as a determinant of fatality. True, the majority of those who died were over fifty while the majority of those who recovered were under fifty years of age, but it must be noted that, of the whole series operated upon for common duct obstruction by calculus eight over fifty years recovered (one of seventy years) and four cases over fifty years died (one of 68, one of 72).

2. *Sex,* however, cuts a striking figure. Out of twenty-two operations on women, four were fatal (18 per cent.), while five of the eleven men operated upon died (45 per cent.).

3. *General condition* of the patient also seems to be important. Seven of the fatal cases were in bad condition from chronic alcoholism, chronic nephritis, chronic pancreatitis. Two were in fair condition at the time of operation. All but four or five of the twenty-five recoveries were in fair or good condition at the time of operation.

4. *The Duration and Severity of Symptoms.*—Signs of the disease had been noted for seven years (on the average) in the fatal cases and for an average four years in those that recovered (if we omit one case of thirty years' standing, which raises the average to six years). The immediate severity of the symptoms of pain and jaundice, however, do not seem to have definitive value.

5. *Time of Operation.*—Stage of the disease: Six who died were operated during symptoms of acute infection. The three others were interval operations. Only six or seven of the recoveries were operated during acute symptoms.

6. *Length and Difficulty of Operation.*—Six were long and very difficult. Three presented no unusual difficulties. This factor seems by itself to be in most cases of secondary importance, for many of the successful operations were apparently as long and difficult as the unsuccessful ones. In all there were five transduodenal operations. Only one was fatal.

7. *External drainage of the common duct* was practised in all but one of the fatal cases and in all but three of the recoveries. These four were transduodenal operations with splitting of the papilla of Vater and dilatation of the duct to secure adequate internal drainage.

8. *Complications* appear to be of the utmost importance. Four of the fatal cases had definite signs and two others had signs suggestive of pneumonia. Two had well-marked chronic pancreatitis. Two had tuberculosis, one pulmonary, one peritoneal. Two had chronic nephritis, three had peritoneal abscess and one had myocarditis.

Among those who recovered there were several whose convalescence was complicated by wound infection or chronic sepsis and one each by an acute exudative pleurisy on the twenty-third day and by an acute suppurative cholecystitis on the forty-fifth day after operation; but it is notable that none of those twenty-five who recovered had shown signs of pneumonia, while six of the nine who died had shown them. And whether they died with or of pneumonia this complication must be regarded as a frequent determinant of fatality.

To recapitulate then, we find that in this series (1) sex, (2) general condition of the patient, (3) the length of time that he has had the disease, and (4) the stage of the disease (acute or interval) in which he is operated are all factors bearing upon the mortality of this operation; but that complications pre-existent to, concurrent with, or consequent upon the patient's biliary obstruction are the chief factors in determining a fatal outcome of the operation for its relief.

Is there a remedy? Can we do better than we have done with the cases—as we get them?

Upon the number and severity of the pre-existent or concurrent complications we can have no effect unless by persuading the medical men to turn over gall-stone cases earlier to the surgeon. There is so much importance in this consideration that one hardly considers it hyperbolical to say that, in the final analysis, many of these cases die of delay, as they used to with appendicitis.

Over the complications consequent upon operation we may perhaps exercise some control. Pneumonia in our experience is the chief among them. Now, the incidence of pneumonia, like all other bacterial diseases, is due to a lack of sufficient resistance to infection and its fatal outcome depends upon a failure to develop immunity. Whatever we do, therefore, to increase the patient's resistance, and whatever we refrain from (with a similar purpose) may probably lessen the frequency with which this complication appears.

Since even the strongest person in the healthiest possible condition can be killed by operative procedures sufficiently mutilating and prolonged (as was frequently proven in the days of the Inquisition), and since a sufficiently large dose of ether is lethal to the most resistant individual, it is plain that the least extensive and the most rapid operation (within limits of necessity) and the briefest and best administered anæsthesia will lay the lowest tax upon our patient's resistance and best conserve his possibility of acquiring immunity, not only against his existing infection but against others possibly in prospect. These are things that every surgeon knows. But he is liable occasionally to forget them.

Interval operation, of course, represents operation during the positive phase of the patient's immunity procedure, and is therefore desirable. But, and there is a necessary emphasis on this, it is not always

The patient left the operating table in poor condition and died six hours later, apparently of operative shock. It is just possible that this woman, also, might have done better with a preliminary removal of the gall-bladder with cystic duct drainage and (providing she survived that) a secondary operation on the common duct.

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Is there a remedy? Can we do better than we have done with the cases—as we get them?

Upon the number and severity of the pre-existent or concurrent complications we can have no effect unless by persuading the medical men to turn over gall-stone cases earlier to the surgeon. There is so much importance in this consideration that one hardly considers it hyperbolical to say that, in the final analysis, many of these cases die of delay, as they used to with appendicitis.

Over the complications consequent upon operation we may perhaps exercise some control. Pneumonia in our experience is the chief among them. Now, the incidence of pneumonia, like all other bacterial diseases, is due to a lack of sufficient resistance to infection and its fatal outcome depends upon a failure to develop immunity. Whatever we do, therefore, to increase the patient's resistance, and whatever we refrain from (with a similar purpose) may probably lessen the frequency with which this complication appears.

Since even the strongest person in the healthiest possible condition can be killed by operative procedures sufficiently mutilating and prolonged (as was frequently proven in the days of the Inquisition), and since a sufficiently large dose of ether is lethal to the most resistant individual, it is plain that the least extensive and the most rapid operation (within limits of necessity) and the briefest and best administered anæsthesia will lay the lowest tax upon our patient's resistance and best conserve his possibility of acquiring immunity, not only against his existing infection but against others possibly in prospect. These are things that every surgeon knows. But he is liable occasionally to forget them.

Interval operation, of course, represents operation during the positive phase of the patient's immunity procedure, and is therefore desirable. But, and there is a necessary emphasis on this, it is not always

possible to tell whether there is going to be another interval to follow the attack we are observing.

In such cases as this I believe that it might prove a life-saving measure to restrain a very natural desire to do as complete an operation as possible, and practise, instead, a mere drainage of the abscess, if there be one; or a simple drainage of the common duct, in its upper part; leaving the attempt at complete removal of all obstructions till a later time, when the patient, if he lives, will have acquired greater resistance to meet the greater demand upon it which prolonged operative procedure brings.

And, finally, having examined the evidence as carefully as it could be examined, after the fact, and having weighed it as impartially as only one who has done none of the recorded operations can weigh it, I am glad to believe that (with the possible exception of three cases, A268, B1873 and B4449) the mortality in this particular series would have been no lower in other hands than ours. And I have to thank the men who did these operations for their courtesy in permitting me to report them.

THE ETIOLOGICAL RELATIONS OF THE SEQUELÆ TO GASTRO-ENTEROSTOMY

TOGETHER WITH THE DESCRIPTION OF A SIMPLE OPERATIVE TECHNIC

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Some fifteen years ago we were led, by the serious nature of the after-effects of the gastro-enterostomy, to institute animal experimentation for the purpose of clearing up the etiology of certain of these sequelæ, and, if possible, the simplification of the technic of operation and elimination of these troublesome phenomena.

Early in the course of the work, the use of clamps for the juxtaposition of tissues was abandoned, and somewhat later we began using catgut to replace the non-absorbable materials then employed for sutures, with the most gratifying primary and secondary results.

Numerous changes were made in the method of anastomosis until finally a simple and flexible technic was evolved. So gratifying, in fact, were the experimental results that immediately (in 1903) this technic was substituted in human surgery and the clinical records of some 140 cases operated by the new method with the use of catgut sutures are now available.

ANIMAL EXPERIMENTS

Beginning in 1902, at the Chicago Post-Graduate School and continuing at the Chicago Polyclinic and at the Illinois Post-Graduate School, some 5000 dogs were used in this work, with results now to be stated.

More than 150 dogs were subjected to long-loop gastro-enterostomies with the use of clamps and silk sutures. As it was not then our purpose to criticise the use of non-absorbable suture material, the operations being done entirely to investigate the etiology of sequelæ, the greatest care was observed to prevent too great constriction of tissues—only sufficient force being used in tying the sutures to prevent leakage and secure the necessary apposition. Also, there was no unnecessary traumatization by the clamps.

Of this series, 20 per cent. died within two days, practically all with symptoms of obstruction. They were immediately examined postmortem and histological investigations made. On opening the abdomen, it was found that kinking of the long loop had been the principal cause of the difficulty, and that much of the abdominal

contents was already more or less completely involved in a plastic exudate. The gastro-intestinal junction was explored, the patency of the stoma was demonstrated, and in some cases portions of tissue were subjected to microscopical examination. The appearance of the tissue immediately surrounding the stitches led to the discovery of considerable infiltration with lymphoid cells. The gastric and jejunal mucosa showed, in over 60 per cent. of these animals, hemorrhagic spots or ecchymoses. One dog undoubtedly died more as a result of hemorrhage from the edge of the operative wound than from a partial obstruction also present. This was the only case in which hemorrhage from the wound happened.

The remaining dogs were killed and examined after intervals of from thirty to ninety days. Many had not recovered from the operation; in fact, the mortality from the tenth day to the time of killing had been about 6 per cent. Autopsy showed varying degrees of obstruction in more than 30 per cent., this being due, in 26 dogs, to distortion of the lumen of the efferent loop by tension of attached adhesions. One dog showed definite tissue proliferation at the gastrojejunal anastomosis, forming a flap which had presumably acted as a valve obstructing the efferent passage. This may have resulted partially from too tightly suturing the serosa, although the occurrence of such an accident is doubtful. In one case the stomach was found markedly dilated, but no definite cause for obstruction could be demonstrated. Here again minute examination of the mucous surfaces was made, resulting in the discovery in more than half of these animals of definite peptic ulcers of the jejunum, the ulcers varying from barely microscopic size to a diameter of 3 cm. They appeared most frequently in the immediate neighborhood of the artificial stoma.

These findings prompted us to repeat the operation on a few animals without using clamps. The results in this case differed from the previous only in the comparative absence of adhesions in cases surviving thirty to sixty days; ulceration of the jejunum was still a frequent finding.

The silk suture material was then replaced by chromic catgut, which was a little later abandoned for pyoktanin and plain catgut. The results were of such a nature that the work was carried on until some 4500 animals had been submitted to this and to modified gastro-enterostomies, always without clamps and using plain or pyoktanin.

The mortality following the long-loop operation was greatly reduced and, in some 2000 experiments with the technic to be described, we found a ten-day mortality of six-tenths of one per cent. and a later mortality (excluding cases in which definite extra-operative disease caused death) even lower. Complete recovery from the effects of operation was witnessed in over seven-eighths of

all cases. Autopsies, performed after from thirty to one hundred and twenty days following operation, demonstrated a general absence of adhesions, those occasionally encountered being confined to the immediate neighborhood of the anastomosis. Careful examinations of the mucosa showed a notable absence from peptic ulceration, either at the gastro-intestinal junction or in the jejunum, in fact, ulcers were found in less than one-eighth of one per cent. and these found were generally very minute and appeared only in cases on which an early autopsy (thirty days) had been made.

Mechanical failure of the catgut sutures was never observed.

From this work, the conclusion was reached that the use of clamps was very undesirable, in that, on the one hand, they caused trauma of a severe nature to the mucosa of the stomach and jejunum, a belief concurred in by Coffey, Sinclair White and Hamilton; and on the other hand, the serosa of both organs was injured to the extent of loss of substance and resulting plastic exudation of an extensive character with subsequent adhesion formation which later gave rise to much trouble, even frequently causing obstruction of the efferent loop. The occurrence of this adhesion formation is commonly noted in the literature, one of a great number of illustrating examples being the case (upon which five operations were made) reported by John B. Deaver in the *New York Medical Journal*.[1]

The noteworthy frequence of peptic ulceration following the use of silk sutures and the almost total absence of this sequela after the catgut anastomosis convinced us that here was the etiology of this after-effect. In fact, so completely were we convinced that catgut was ideal for this kind of suturing, that we began its use in human surgery in 1903, and have used it exclusively since, including more than 140 gastro-enterostomies, with mechanical failure in no case, without a single mortality from the operation or its after-effects, and without, since the introduction of our modification in the technic, a single bad result of any description.

REGURGITANT VOMITING

Regurgitant vomiting, the so-called "vicious circle," has constituted at once the most frequently reported and the most eagerly investigated sequela to gastrojejunostomy. The original methods of Wolfler (1881), and, in fact, all antecolic gastrojejunostomy methods have been almost entirely abandoned, now being advised only in case of dense posterior adhesions of the stomach and massive carcinoma involving the dorsal stomach wall and in cases where a congenital anomaly in the form of a very short mesocolon is found.[2] This is owing largely to their great liability to this complication. Theory has run riot in explaining this phenomenon—the passage of time has seen the partial overthrow of every theory so far advanced. The literature is replete with modifications of

technic intended to obviate this difficulty, yet we still find it occurring occasionally after every form of operation so far used.

One point is especially worthy of discussion, viz: The relative infrequency of regurgitant vomiting following the use of the Murphy or other button, a fact noticed by almost every surgeon of large experience in this work. We have here the chief argument in favor of the "valve hypothesis," the explanation by the supposition of tissue proliferation or folding at or near the gastric attachment of the efferent loop, acting either by obstruction of the flow from the afferent to the efferent loop (Lauenstein, Braun and Jaboulay), or obstructing the outflow from the stomach into the efferent loop while the afferent loop remains patent and receives the gastric contents. To prevnt this supposed difficulty, the modifications of Kocher, Hadra and Lauenstein (valve or spur formation by the surgeon in the mouth of the afferent loop), of Littlewood and Moynihan (construction of the anastomotic opening of the afferent loop), of Chlumsky (twisting of the afferent loop through an angle of 180° before gastric attachment), of Mayo, Lauenstein, Braun, Jaboulay and others (entero-anastomosis), of Wolfler, Chaput, v. Hacken and Fowler (constriction of the afferent loop) and of Doyen (division of the afferent loop) have been recommended and in turn found wanting in certain cases.

To prevent mechanical kinking of the bowel, surgeons have gradually changed from the antecolic to the retrocolic route and from the long-loop posterior operation to the "short-loop" and "no-loop" methods, yet still we find regurgitant vomiting reported, —happily, with growing infrequency, this bearing out, to some extent, the doctrine of Terrier, that vicious circle is due to faulty technic.

One fact has been fully demonstrated, *i.e.*, that the flowing of the duodenal juices into the stomach is not in itself a sufficient cause for vomiting, much less, for vomiting of such severe nature as occasionally follows the operation. We here refer in part to the work of Dastre and to the well-known case of Moynihan in which the afferent loop was totally obstructed so that the bile and pancreatic secretions were forced to pass through the stomach to reach the anastomotic opening, but more especially to the clinical reports of Paterson,[3] who detected bile in the stomach contents of 73 per cent. of all his gastro-enterostomy patients.

Two cases upon which we performed secondary operations (the first operations having been done elsewhere) showed the cause for recurrence of symptoms to be a partial obstruction of the efferent jejunum by the tension of very dense adhesions. In both cases, the gastric stoma was found patent and of sufficient size. The adhesions were destroyed and the patients thereby relieved of symptoms of gastric difficulty.

SEQUELÆ TO GASTRO-ENTEROSTOMY

JEJUNAL ULCER

Notwithstanding the supposed rarity of jejunal ulcer following gastrojejunostomy, it is the belief of the author that many of the "improved, but not cured," cases are directly referable to this sequela. V. Eiselsberg[4] saw peptic ulcer in only 7 out of 317 gastro-enterostomies, but expressed his belief that they were not the entire number. Further, he emphatically agrees with v. Huberer in stating that jejunal ulcer is a very serious condition. Moreover, when one considers statements like that of Willy Meyer[5] in which he reports a case that, "In spite of his apparent good health, however, as far as gastric symptoms were concerned, he had on at least three occasions had tarry stools—but without pain," and the findings of Paterson,[6] who considers 52 cases of definite jejunal ulcer and 9 doubtful cases collected from the literature, of which, in every one of the 52 definite cases, the ulcer was shown to have perforated the bowel, one cannot but believe that any except severe cases are reported and these not invariably.

The results before stated in the animal experimentations when silk was used for suturing were such as to inspire a belief in the frequency rather than in the rarity of this complication.

Based upon the histological examinations, a conclusion was reached that these ulcerations were primarily caused by focal necrosis following inflammatory reaction in the neighborhood of the introduced foreign bodies (silk sutures) and by infarcts of the mucosa due to circulatory disturbances caused by inflammatory thickening, where they could not be traced directly to trauma and hæmatoma formation.

The recent work of Rosenow may offer yet another explanation if the supposed existence of a septicæmic infection as the cause of gastric and duodenal ulcer be accepted, for a foreign body present for a long time may so reduce the normal resistance of adjacent tissue as to lead to the formation of local foci of infection. However this may be, the statement of Wm. J. Mayo, that in three cases of gastrojejunal ulcer, one was due to an impacted Murphy button, one to an infected stitch, and one to a hæmatoma, is clearly pertinent to our hypothesis.

Schortak[7] examined 34 cases of peptic ulcer and found 18 below the site of the gastro-enterostomy, 15 on the margin of the gastro-intestinal anastomosis, and 1 in the margin of the entero-anastomosis, facts in no way refutory to our assumption.

PREMATURE CLOSURE OF THE ARTIFICIAL STOMA

Occasionally the new mouth has been observed to close and obstructive symptoms then result. The relation of the Murphy button to this phenomenon has already been mentioned. V. Eiselsberg[4] declares that closure or reduction in the size of the gastro-enterostomy opening is due practically always to peptic ulceration,

although closure of the pylorus in the course of the primary operation has been recommended as a preventive measure, based on the work so well summarized by Guibe,[8] who reviews the experimentation of Blake and Cannon, Leggett and Maurey, Kellog, Dilbert, and Tuffier, and adds original work supporting the conclusion that in the presence of a patent pylorus ". . . nothing whatever passes through the new opening; on the contrary everything passes through the pylorus."

Henri Hartmann[10] criticises the above authorities, and, agreeing with Calabrene, cites radiographic observations to support the conclusion that " the gastro-intestinal anastomosis may (and does) work even in cases where the pylorus is patulous."

J. M. T. Finney[11] saw a case in which, in the face of an absolute pyloric stenosis, the gastro-enterostomy opening had been reduced to the size of a straw.

Especially worthy of note by the interested physician is the article by Scruger,[9] published in 1914, in which remote results of these procedures are discussed. The author believes with Scudder[12] that pyloric closure is far better to be considered as a secondary operation when results show it to be necessary, rather than as a part of the primary procedure.

OPERATIVE TECHNIC

The hand is placed on the anterior stomach wall, with the omentum and transverse colon gathered up between the thumb and forefinger (Fig. 1) pushing the stomach against the mesocolon.

The mesocolon is now opened with a blunt forceps, and the tear extended until an elliptical opening about two and one-half inches long (Fig. 2) results; the edges are then attached to the posterior wall of the stomach by four stitches, the end stitches being left long and used as temporary guides (Fig. 2).

If the mesenteric attachment of the bowel is far enough to the right, bring the bowel straight up in prolongation of the duodenum (Fig. 7); if not, turn the bowel from left to right (Fig. 2), otherwise a kink at the duodenojejunal junction will result, with the probability of obstruction.

The bowel is now brought up into juxtaposition with the stomach and guides placed at each end, the first guides being now cut. An over-and-over Lembert suture is then used (Fig. 3).

The assistant now exerts steady traction upon the guides, thus preventing leakage, and the stomach and bowel are opened. The same suture is used to whip over and over with a through-and-through stitch, so as to coaptate the mucous surfaces (Fig. 4).

With a Cushing stitch, the anterior stomach and bowel walls are coaptated (Fig. 5), and the operation finished with a Lembert suture, making two rows of sutures all the way around (Fig. 6).

Number 1 pyoktanin catgut is used exclusively, as has been the case for the past ten years.

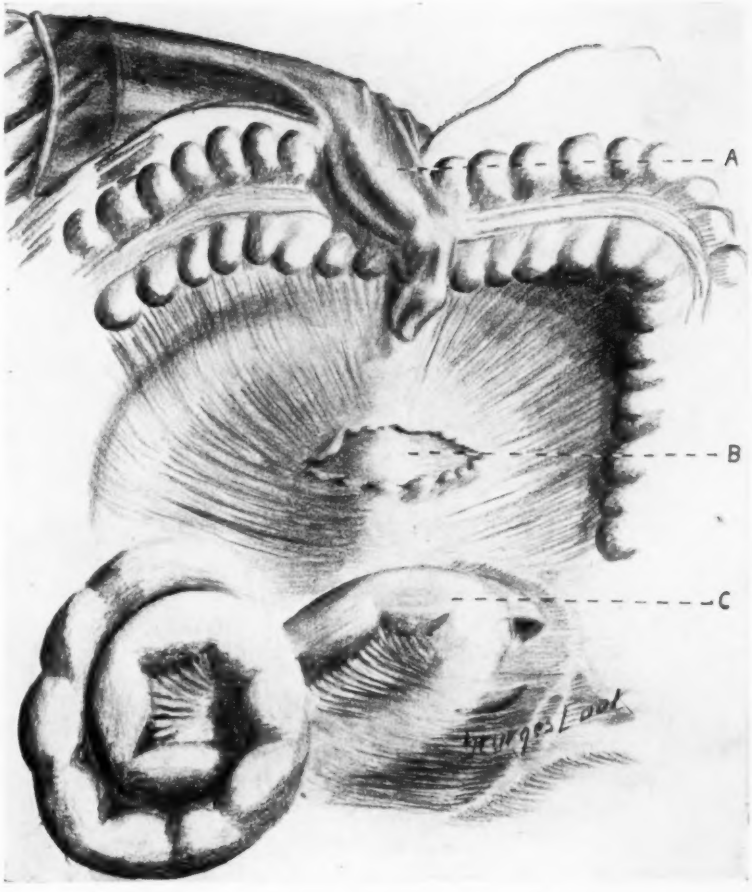

FIG. 1.—*A*, hand over omentum and transverse colon; *B*, stomach wall showing through incised mesocolon; *C*, jejunum.

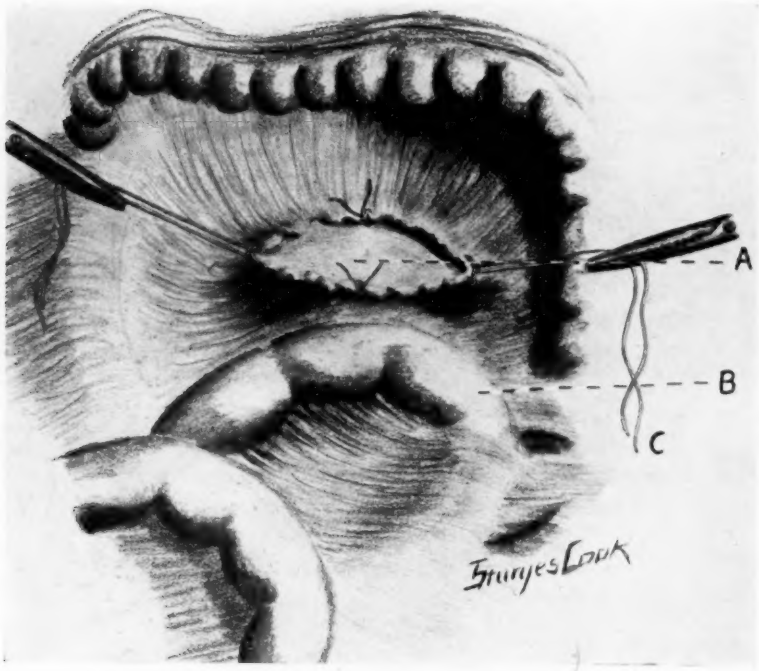

FIG. 2.—*A*, wall of stomach; *B*, jejunum; *C*, preliminary guide ligatures.

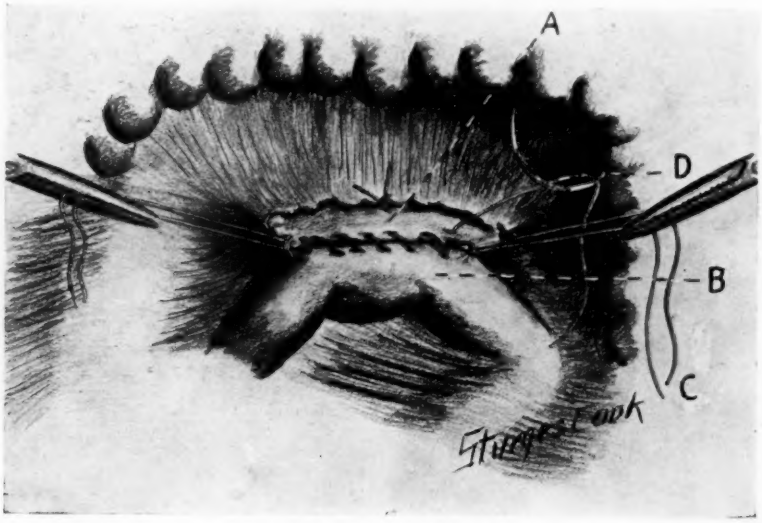

FIG. 3.—*A*, stomach wall; *B*, jejunum; *C*, guide ligatures; *D*, catgut used as first row of sutures.

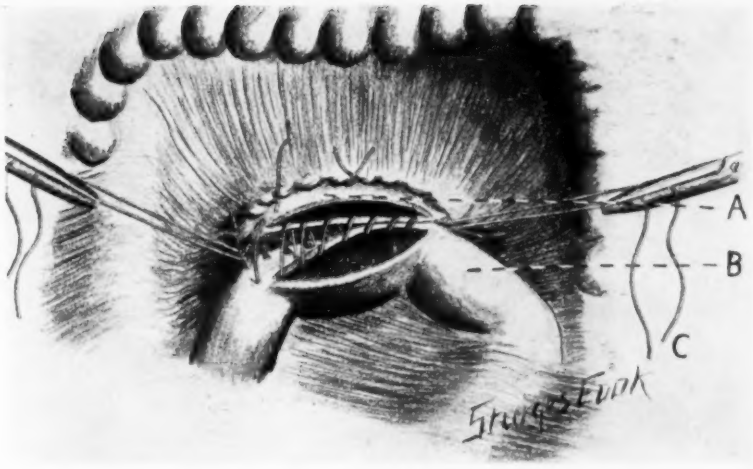

FIG. 4.—*A*, incision in stomach wall; *B*, jejunum; *C*, guide ligatures.

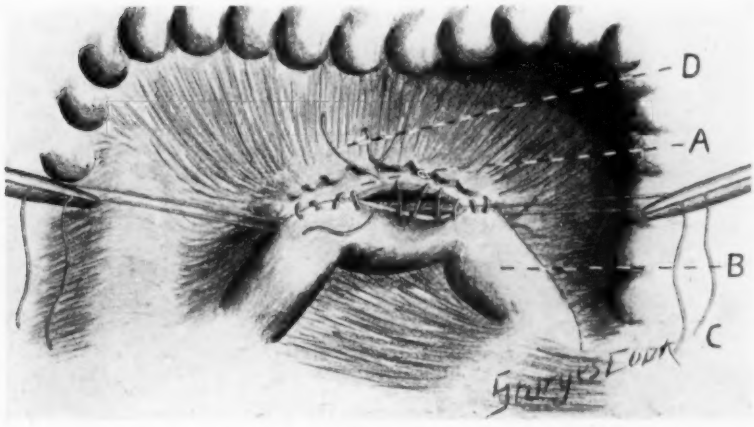

FIG. 5.—*A*, surface of stomach; *B*, jejunum; *C*, guide ligatures; *D*, catgut sutures.

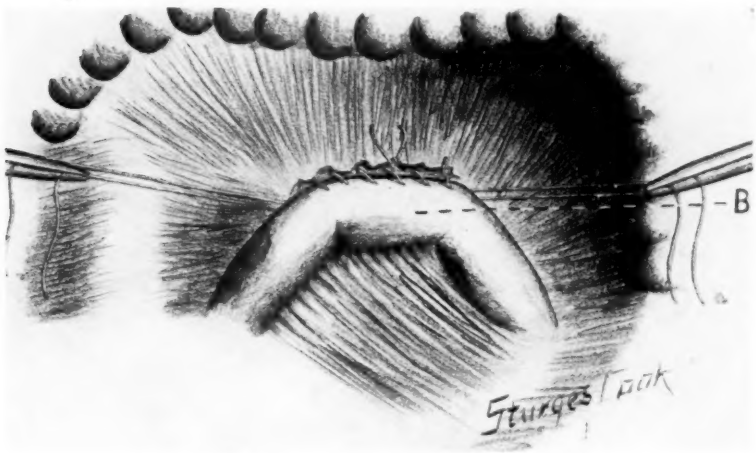

FIG. 6.—*A*, wall of stomach; *B*, jejunum.

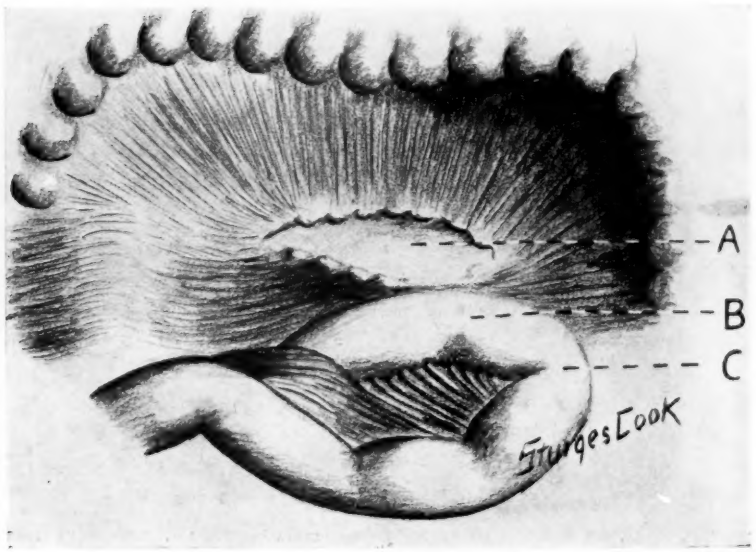

FIG. 7.—*A*, wall of stomach; *B*, section of jejunum to be attached to stomach when duodenal-jejunal junction is sufficiently far to the right; *C*, section to be used under other circumstances.

SUMMARY

The described operative technic offers the following points of interest to the surgeon:

1. If a laparotomy is made and pathology is discovered in the stomach, this form of gastro-enterostomy may be made at once.

2. Less assistance and no special clamps are necessary; of such nature is the procedure that it has been successfully performed upon a kitchen table in a town far removed from hospital facilities.

3. It is more adaptable than the clamp method, being suited to the field of operation rather than the field being adjusted to the surgeon and his clamps.

4. In certain carcinomatous conditions of the antrum of the stomach and where there are present large posterior adhesions the posterior gastro-enterostomy with clamps becomes impossible, yet this operation may still be performed, as a large field is not necessary.

5. Tension on the guide sutures eliminates any danger of leakage and resulting peritonitis as effectively as does the use of clamps.

6. Uniform approximation of the tissues. Greater ease of introduction of the sutures, and less danger of too great tension being used in tying the sutures results from the absence of the discretion of anatomical structures and relations produced by clamps.

7. Greatly decreased degree of local trauma, and resulting reduction in the liability to adhesion formation; a point, by the way, which has led Hartwell of New York to abandon the use of clamps.

8. Marked reduction in disturbance of the sympathetic nervous system and resulting shock or atonic dilatation of the stomach, as the stomach wall is dragged far less than is necessary to secure sufficient tissue between the clamps.

9. Practical impossibility of hæmatoma formation, because of the absence of bruising by the clamps and increased facility in locating bleeding points.

10. The very short period during which foreign substance remains in the tissues, this reducing the liability to necrosis and ulcer formation.

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POST-OPERATIVE PARALYTIC ILEUS

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Ileus has been defined as a retention of the intestinal contents. I wish at once to make a clear distinction between ileus from a mechanical obstruction and ileus from a paralysis of the musculature of the intestine; in this paper I will deal only with the latter, and the two must not be confused with each other. Paralytic ileus is wholly a retention from complete muscular atony and not from an organic obstruction; yet many authors will speak of a paralytic obstruction. In this there is no onward movement of the intestinal contents and no attempts at the same, therefore, there can be no obstruction unless something is being prevented from passing on. However, McLean claims that the clinical picture is the same in both conditions; with this we cannot agree, as our observations have shown them to be most unlike clinically. This will be described more fully later on.

This serious post-operative complication has not received the attention it deserves. Although much has been written upon the subject, it is really not well understood and we believe not recognized readily by us. Relatively little is known as to its etiology and there has been but little research work upon the subject, and what has been done has been mostly to determine the cause of death, by showing which portion of the intestinal secretion and contents were more poisonous; however, the research has been of distinct therapeutic value. We know better what to do in case it arises than we do what causes it or how to prevent it. Our text-books are peculiarly silent upon the subject or have it jumbled up with all kinds of mechanical intestinal obstruction.

There is a certain amount of paralytic ileus after every abdominal incision as is evidenced by the usual accumulation of gas with which we are familiar and which gives us no grave concern.

Occurrence.—It may occur after any abdominal operation or even after only the administration of an anæsthetic; however, it is said by some to occur more frequently after certain operations, *e.g.*, after resection of the omentum, rough handling of the intestines in any operation in the abdomen, or following an operation for relief of volvulus or intussusception, where the mesentery is more or less injured. Lack of pelvic drainage is claimed by Mr. Hicks as a causative factor. The same author says that it has occurred in his practice five times in three hundred abdominal operations; in my own experience it has occurred four times in approximately seven hundred operations. Rather oddly it has occurred to me three times in the last year, and I trust

that now the rather fateful occurrence of serious or odd things happening "three times in succession" has been satisfied and that I may be spared this perplexing complication for some time again.

We believe very firmly that this condition is often incorrectly diagnosed as an acute dilatation of the stomach and treated as such, and in its later stages for a general peritonitis.

It may involve either the whole intestinal tract, only the upper portion of the small intestine, only the large intestine, or only the lower portion of the small intestine, but the more common site is the jejunum or upper portion of the jejunum.

Etiology.—There is little definitely known as to its etiology. Some claim that it is always due to a rapidly spreading peritonitis or to a localized peritonitis. This is hardly reasonable, as it occurs fully as frequently after clean operations as after pus cases. McKenna thinks it is due to a disturbance of the innervation through the splanchnic nerves of these certain portions of the intestine. This is true, but he cannot offer explanation of the factor producing the disturbance, other than it is due to the absorption of certain toxins. At any rate, it is a peculiar response, an idiosyncrasy, so to speak, from the shock occasioned by either infection or trauma from the operation. This is my own suggestion, but it cannot be really an explanation, because we do not know why an idiosyncrasy does occur.

In general peritonitis we have a paralytic ileus and the etiology here is very evident, but we probably cannot reason from this that it is always caused by a peritonitis of some type.

Diagnosis.—Onset is usually within thirty-six to sixty hours, with a mild distention in the upper abdomen, usually, and has the appearance now of a slightly dilated stomach. It is without pain all the way through and without shock until later in its course. It has a peculiar, soft doughy or "gassy" sensation upon palpation, which is increased and very marked later on as the belly becomes more distended. Percussion may show a varying dulness and gaseousness with changes in position, due to both fluid and gas in the intestine; this has been referred to as a "pseudo-ascites." It may be that more or less gas has been passed with enemas previous to the onset; this comes from the lower unparalyzed portion of the gut. There is usually no particular rise in the temperature nor in the pulse in the early stages, but later the pulse always increases and the temperature usually; respirations are normal in the beginning and increase as the pressure from below embarrasses both lungs and the heart. The patient himself always says he feels fine even when death is impending. One of my patients demonstrated this most remarkably when I entered the room forty minutes before death, I spoke as cheerfully as I could, "Well, Charles, how are you feeling?" He answered at once, quickly and brightly, "Feeling just fine, Gee" (calling me by my college nickname), yet the whole appearance was that of impending dissolu-

tion; to me, yet, the cheerfulness of this remark remains as being almost uncanny. I wish also to offer, as a diagnostic sign in this condition, my observation in each of my four cases, namely, a peculiar complacent appearance of the face amounting to a sort of kindly, benignant expression, such as is sometimes seen upon the faces of elderly phlegmatic persons; this in contradistinction to the hippocratic facies of general peritonitis and in mechanical obstruction of the bowel, where they are suffering great pain from the peristaltic wave. There is usually a gulping up of bile-stained fluid early and the stomach washing relieves this only for a short time, often requiring several gallons of soda solution before it is returned clear; in fact, in one case I used as much as seven gallons in one washing and even then the fluid was not clear. Vomiting is without pain and nausea.

One is often fooled by the unalarming appearance of the patient and may be lulled into a false sense of security by this, for the critical stage is reached so gradually that you can hardly realize that death is impending, for, as mentioned above, the mental condition may remain normal, and, at most, there is little more than a mild delirium. I think this is most unfortunate, for it almost urges us to delay suggesting more radical procedures, and I might interpolate here that I regard this condition as one not only requiring but demanding immediate operative, mechanical relief. This is certainly no place for the timid surgeon or internist who calls procrastination by the soothing term " conservatism;" the emergency is present and your patient's life depends upon relief from the poisons retained in the upper intestine, and it is no time for you to consider what the relatives and friends will think of your ability or whether they will criticize you in advising another operation. It is something that you owe to your patient and to your profession to refuse to consider the possible effect upon your standing, but to offer him perhaps only a gambler's chance for his life.

Differential Diagnosis.—(*a*) Ordinary post-operative gas distention: In this condition there is always pain; there is no gulping; there is tenderness always over the whole abdomen; the distention does not markedly increase; pulse-rate may be slightly increased.

(*b*) General peritonitis: Here pain and tenderness are usually present; temperature is increased; pulse is rapid and perhaps weak; temperature usually precedes the distention; hoppocratic facies present; vomiting is preceded by other important symptoms of temperature, rigidity, pain, etc.

(*c*) Mesenteric thrombosis: Practically the same as in acute intestinal obstruction.

(*d*) Acute intestinal obstruction: From records of thousands of cases of acute intestinal obstruction, pain is a constant symptom in the early stages, coming on intermittently; tumor mass often present; peristalsis often observed, especially through thin belly walls; vomiting is forcible and not a gulping; may be blood by the bowel; distention is

very much less marked and rigidity and tenderness is always present.

From the above and from my own observation I cannot see any marked resemblance between paralytic ileus and any of these other abdominal conditions, except acute dilatation of the stomach, notwithstanding the assertions of other men; and certainly to me there could be confusion only with a dilated stomach from the clinical findings. It is my opinion that the differentiation can be made exact only with the X-ray, with a small amount of bismuth in the stomach. The X-ray is always advisable in either paralytic ileus or acute dilatation of the stomach, and clinches the diagnosis by demonstrating the enlarged stomach or the distended loops of the small gut sometimes as much as three inches in diameter, as shown in two of my cases, one of which came to autopsy. I further feel very sure that a good percentage of the cases diagnosed clinically as dilated stomachs are paralyses of the intestine. This was quite certainly demonstrated in one of my cases in a ward at St. Joseph's Hospital. I invited several of the surgeons and internists in to see this case, and all of us, with the exception of Dr. Arneill, called it stomach. As I, too, had called it stomach and treated for same, I had an X-ray taken with some bismuth in the stomach. This organ was crowded up high into the diaphragm and not dilated and the immensely distended small intestines filled the entire belly cavity. This plate I showed at a County Hospital Staff meeting last year in connection with Case II reported below.

Cause of Death and Morbidity.—Bonney [4] asserts that the fatal results are due to toxic absorption from the upper intestinal tract, brought about by the ascending infection of *Bacillus coli communis* and other organisms of the lower gut in a state of exalted virulence and activity. This view is held by many men. Kelsall [5] believes the cause of death is due to the loss of fluids with consequent drop in blood-pressure and resulting carebral anæmia, with the upward pressure upon the heart and lungs and with toxæmia. Andries [6] also believes that the critical symptoms and death are due to loss of body fluids, and Hartwell and Hoguet have demonstrated experimentally that animals with experimental mechanical ileus can be kept alive almost indefinitely by the administration of quantities of saline infusions to replace the fluids lost. McLean refutes all these after producing experimental ileus upon animals, and asserts that it is either the secretions or the altered physiological relation of the secretions of the duodenal mucosa that produce both the alarming symptoms and death. He is upheld in this by the experimental studies of Whipple, Stone and Bernheim.[7]

My own treatment of the two fatal cases would certainly eliminate the loss of fluids as being a factor in death, for both were given large quantities of fluids and their blood-pressure remained normal until soon before death. To my mind toxæmia is the cause of death and

I do not believe that we can separate effects of toxins of bacterial origin and those of changed glandular secretions. One thing has been pretty well demonstrated, and that is, in retention of the upper bowel contents, from high obstruction or paralysis, the mortality is higher. This might add weight to McKenna's [8] idea of upset physiology in upper tract.

REPORT OF CASES

CASE I.—Mr. E. T. N., aged forty-two, was operated by me August 19, 1912, for a very large right-sided inguinal hernia and a very large left-sided hydrocele. Operations were done at one sitting under local anæsthesia of novocaine. The patient being fat and so much omentum being in the hernia, I felt it was advisable to resect the portion of omentum which was in the hernia. This I did. On the second day the patient became distended in upper abdomen, which I diagnosed as a dilatation of the stomach and gave the usual treatment for the same, but he did not respond. We did not have the typical findings from the stomach washing, but a number of my surgical and medical friends, ten in all, saw him and all but one diagnosed acute dilatation of the stomach. I then had an X-ray taken by Dr. Stover with a small amount of bismuth in the stomach, and we found that the stomach was normal and the small intestines were enormously dilated, even as much as three inches in diameter. This patient's condition remained good, and he did not pass gas nor fæces until the tenth day; however the distention was the same throughout and I feared it would prevent the hernia from properly healing; but it did not, nor did the wound become infected. The medical treatment described below was used here after the proper diagnosis was reached. To me this is a most astonishing case—this man's abdomen was as large as a tub, but his mental condition remained normal and he joked with the other ward occupants about the size of his belly.

CASE II.—Mr. G., aged seventy-two, County Hospital. January, 1916. Operated under local anæsthesia for a very large inguinal hernia. This hernia contained probably not less than ten or twelve feet of the small intestine with cæcum and appendix; the bowels were entirely empty, as he had undergone preparatory treatment for the operation. On the third day he was distended evenly over the entire abdomen, no pain nor tenderness, some gulping of fluid, but did not become stercoraceous at any time; the pulse and temperature were only slightly elevated; no hippocratic facies. He was treated by hot stupes and pituitrin, with many gas enemas, and when results from the enemas were evident, cathartics were given. Patient made an excellent recovery, nor was the healing of the wound interfered with.

CASE III.—Mr. C. A. was operated for appendicitis. The appendix was retroperitoneal and lying high in the abdomen; in fact, the tip of it was posterior to the second portion of the duodenum, and was removed with much difficulty. He was given

ether and took it badly, having to be resuscitated during the operation. His condition, however, was good the next day and also the second day, when the distention began to appear in upper abdomen. He was given gastric lavage, pituitrin and salt solution under the skin, lavage was continued right straight through at regular intervals day and night, but rarely did we get the fluid to return clear, even with as much as seven gallons of soda water; large amounts of stimulants were used, as the heart became rapid and weak. The patient's mental condition remained clear until the end, except for slight delirium, but he would talk normally when spoken to, even until a short time before death, which occurred five days after the appendectomy. A post-mortem examination was made and the stomach was normal in size, also the duodenum; the jejunum and all of the ileum except the last forty inches were distended to about two and one-half to three inches in diameter; the lower ileum and colon were normal, there was no obstruction to the gut anywhere, and the line was abrupt and definite between normal and dilated ileum.

Consultation was held with four doctors and surgeons and a jejunostomy was proposed, but thought then to be too late. I made up my mind from that case that I would not trust to medical measures in the future even though I had been successful in Cases I and II by non-operative measures.

Case IV.—Mr. R., aged forty-two, referred to Dr. Horace Heath, was operated for a ruptured appendix, under novocaine anæsthesia. Patient was in excellent condition until evening of the second day, when there was a mild painless distention in upper abdomen; no increase then of either temperature or pulse. Patient said he never felt better. The distention increased gradually with slight increase of temperature and pulse; some fluid was gulped up; stomach washed and fluid returned clear. On the third day his condition was worse, and we did an anastomosis between a dilated portion of the jejunum, which later proved to be about five feet from its beginning, and the sigmoid. This operation was also done under novocaine, and that night and the next day a good quantity of brownish material and gas was passed by the bowel. A suture, side-to-side anastomosis was made. We did this in order to not have a fecal fistula upon the surface, feeling also that it would make the later operation less difficult. We debated whether we should put in tubes from the rectum through the anastomosis, but did not; notwithstanding the passing of several pints of fluid from the bowel, the patient got steadily worse, and death seemed certain upon the fifth day, when we decided to again open the belly and bring a loop of dilated gut to the skin. This was done while the patient was practically moribund. We drained off a very large quantity of gas and brownish fluid by changing his position upon the table; it was a sort of last chance with nothing to lose. The patient died two hours later. A post-mortem examination showed the first anastomosis in excellent position to drain the upper jejunum and I

believe that a Murphy button anastomosis would have done this probably better than a suture. There was no peritonitis to be demonstrated at this time. The upper gut, practically only the jejunum, was dilated, as was shown by an X-ray taken on the third day and proved at post-mortem examination. The blood-pressure in this case remained normal until a short time before death, the pulse was rapid and weak the last twenty-four to thirty-six hours. I have one keen regret in this case, and that is that we did not bring the loop of gut to the skin at the time of anastomosis.

CASE V.—Mrs. J. A. K., referred by Dr. Robert King, aged twenty-four; married; was pregnant two months when she instrumented herself to induce abortion which was accomplished three days before I saw her; condition now one of general peritonitis in desperate condition—Hippocratic facies, temperature 103°, pulse 121, respirations 28. Consultation was had with Dr. I. B. Perkins and we decided that the abdomen should be opened and drained. This I did, found a general peritonitis with considerable involvement of the appendix, which I removed. She then went along fairly well and looked as though she would recover; this was at the end of about a week. She then began to distend markedly in the upper abdomen. At this time I left the city for a week, but advised Dr. James A. Philpott, my associate, that he would probably have to drain the jejunum; this he did later, assisted by Dr. J. F. Roe. At operation it was found that the jejunum was dilated to approximately four inches in diameter. A loop was brought to the skin and opened and drained from both directions. She was immediately relieved of the distention and again in a few days it seemed very favorable for her recovery; however, on the seventeenth day she began to lose ground and died on the twentieth day from a general septic condition. In none of the wounds did healing proceed satisfactorily. A post-mortem examination showed some very interesting facts—the jejunostomy was found to be four and one-half feet from its beginning, the abdomen was filled with adhesions of the loops of the intestines throughout, all the gut below the opening was of normal size and normal in all ways except for the adhesions; no definite point of obstruction could be demonstrated; above the opening was found a most interesting condition. All except ten inches of the intestine had reduced to normal size and appearance; this ten-inch portion was fully four inches in diameter in half its length and the balance about two inches in diameter. Thus it is seen the drainage did really produce a recovery in the immensely distended jejunum, thus proving the efficiency of jejunal drainage in this condition. Just why the one portion did not recover I cannot offer an explanation.

Treatment.—(1) Medical: The usual treatment for post-mortem gas should be instituted early, including enemas, hot stupes to belly, eserine 1/100 to 1/50 gr., pituitrin 1 c.c. each hour for three or four

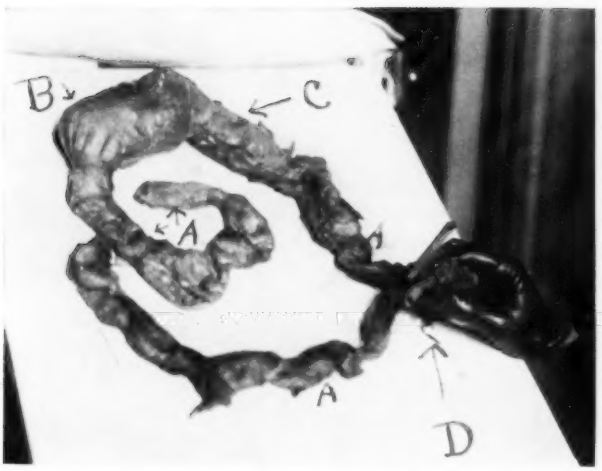

FIG. 1.—Post-mortem specimen of Case V. *A*, normal jejunum above and below the jejunostomy; *B*, the large remaining dilated portion, four inches in diameter; *C*, a portion two inches in diameter; *D*, the point of jejunostomy with a tube in each direction.

hours at occasional periods, unless it has a bad effect upon the heart. Goth recommends physostigmin salicylate 1/64 to 1/32 of a grain, digalen minims 15 each three hours and strychnine grain 1/30 to 1/15 each three hours, and caffeine sodium benzoate grains ii–iii each three hours, these last three alternating one each hour to support the heart. Cathartics are useless and perhaps damaging; gastric lavage hourly or two or three hours; but the best of all is large quantities of water both by bowel and by hypodermoclysis, ten to sixteen pints each twenty-four hours. Bonney suggests adding one ounce of brandy to each quart of saline infusion.

(2) If the above medical measures fail to give relief within twelve to eighteen hours after instituting them, or if your patient should get worse in the meantime, then resort must be had to surgery without further ifs and ands, or a continued waiting policy. The paralyzed gut must be drained at once if one wishes to save the patient; and when we know that this operation was successfully done in 1787 by Renault, following the suggestion of Louis in 1757, and was later revived by Nelaton in 1840, we should not hesitate to undertake it for the want of sufficient precedent or for the lack of the stamp of age upon it.

As to the method of surgical attack, we have the choice of several procedures that have been done and advocated by various surgeons. We may do, as suggested and used by Thompson,[10] an anastomosis between any loop of dilated gut that we may happen to pick up and the ileum just before the entrance to the cæcum, and this combined with an appendicostomy or a cæcostomy; altogether, we think this entirely too large an operation to be satisfactorily used in these desperate cases. You may also do an anastomosis between any portion of the dilated gut and any portion of the large intestine, preferably, we think, the sigmoid. If the cæcum is dilated along with the small intestine, then you may do a cæcostomy as used by Victor Bonney,[11] but we believe that by far the best procedure to undertake is the easiest and simplest of all and will be more likely to get the patient over the present dangerous condition; and that is to simply bring a loop of dilated gut to the skin, endeavoring to get a loop as high as possible, for it is important to get drainage as near the duodenum as one can, for this has been aptly called, by Bonney, "the reservoir of toxicity;" this measure is upheld by McKenna, Whipple, Bernheim, Stone and others, after the gut is brought to the surface and opened immediately after suture to the peritoneum, and a tube passed into the gut in both directions for drainage of both gas and fluids and also to irrigate the intestine with salt solution. McKenna says this operation should always be done under local anæsthesia and we agree with him. Bonney reports 100 per cent. of cures in all of his five cases, and asserts "that no patient with fecal vomiting should be allowed to die

for the want of this operation. Its effect in my cases has been remarkable; in all of them there has been an immediate cessation of vomiting, and all the patients have recovered."

This, of course, requires a later operation within a few weeks to correct the fistula. You may be criticised on account of this later operation, but when one considers that a live candidate for a second operation is of so much more value than a patient dead for the want of a fistula of the jejunum, you will have little hesitancy in urging such an operation in these extremely serious cases. Hicks claims that all one needs to do is to stir up the intestines in these cases and to wash out the peritoneal cavity.

Site of Incision.—The incision should be made upon the left side of the belly, as here you are more likely to pick up the jejunum within a reasonable distance from the duodenum, so that the "reservoir of toxicity" will be better drained.

Recovery of the tone of the intestine comes on quite suddenly, within a few to several hours after operation; and in two of my cases treated medically, tone was regained completely in the course of several hours after recovery really began.

CONCLUSIONS

(1) Exact diagnosis can be made only with the X-ray which should always be used in every case of suspected dilated stomach or intestinal paresis.

(2) Operation must be done early to obtain the best results in this very serious complication.

(3) Do the simplest, easiest and quickest operation, and it must be done under local anæsthesia.

(4) The vomiting (gulping) and the pulse are the best guides to follow as to when to operate. Do not be misled by the patient's statements "That he feels fine," etc.

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FRACTURES OF THE DIFFERENT BONES OCCURRING IN THE GOLD MINING INDUSTRY

END-RESULTS AND ECONOMIC STUDY OF 311 CONSECUTIVE CASES

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In the September, 1915, number of the Annals of Surgery appeared a series of articles on fractures by Dr. Huntington, of San Francisco, Dr. Estes, Chairman of the American Surgical Association Committee on Fractures, and others, in which the statistics were taken from large hospitals of the country and in which they found the difficulty of following them up and giving the end-results.

The thought occurred to me at that time that an even more fruitful field for fracture statistics would be found in many Industrial Hospitals, and to that end I set to work to compile the cases which had been under my own care in such a hospital, and it has been no small task to run each case down.

In August, 1910, the Homestake Mining Company and its employés formed an *aid fund,* the employés contributing $1.00 each per month and the company $1,000.00. With this fund we are able to pay $1.00 a day to the injured men for nine months or more and $1,000.00 in case of death or $800.00 if totally disabled. The company also furnishes free hospital and surgical services to the employé until he is able to return to work; and no man is discharged from service on account of injury. We take care of, on an average, about 100 cases a year. Fifty-five per cent. of these work for the company. All of the cases except fractures of the skull were verified by a two-way X-ray from time to time during treatment and their return to work. In this way we are able absolutely to keep these cases under observation for months.

The object of this paper is not to take up one particular fracture, but all fractures as they came from day to day from the mine. This series commences August 1, 1910, and ends December 31, 1916, and I shall only report a few of the cases individually. All of the cases are acute, and are in our hands from one-half hour to one hour after the injury, and injuries requiring immediate amputation are not reported.

Out of 2,500 men employed about 1,050 are underground workmen. In looking over these statistics you will be surprised at the preponderance of fractures of tibia, fibula, and toes. This is explained by understanding the underground workings. From the shaft a tunnel is run out, a stope or room of large proportions is cut. The rock is shot down from the roof forming a large conical pile sometimes 100 feet in diameter and 50 feet high. The shovelers and car men work on the border of the base. As they work, moving the rock, the surface of the pile

slides down, the rolling rock catching the man's legs or feet, if he is not able to get out of the way fast enough. We find also that most of these accidents happen during the first two hours of the shift, and is explained by the men having a definite amount of work to do during the shift, of eight hours. If they can accomplish the task in six hours they can loaf two hours, consequently they rush their work at the first and are not careful.

These stopes are well lighted by large acetylene lamps, but even this is not sufficient to prevent accidents.

I will now report 311 cases of fractures as they came to us from the works. The tibia and fibula cannot be briefed without cutting out a good deal of the information.

SKULL

Case No.	Age	Time off, days	Vault	Base	Operated bone	Results
1	33	60	1	..	1 Frontal compound	Good
2	32	36	1	..	1 Frontal C. C.[1]	Good
3	32	21	1	..	1 Parietal C. C.	Good
4	33	19	1	..	1 Temporal C. C.	Good
5	38	19	1	..	1 Parietal C. C.	Good
6	36	29	1	..	1 Frontal C. C.	Good
7	36	29	1	..	1 Occipital C. C.	Good
8	34	21	1	..	1 Occipital C. C.	Good
9	31	110	1	..	1 Frontal, Nasal, Ethmoid, Malar C. C.	Good
10	26	38	1	..	1 Frontal, Ethmoid, Malar C. C.	Good
11	32	21	..	1	.....	Good
12	25	35	..	1	.....	Good
13	24	10	..	1	Meningitis	Died
14	30	308	..	1	Petrous Temporal	Good
15	30	6	..	1	.....	Died
16	26	30	..	1	Frontal Ethmoid	Good

MALAR BONE

1 case.....30 days off.

NASAL BONE

5 cases..... 8 days average.

LOWER JAW

Case No.	Age	Time off, days	Vault	Base	Operated bone	Resuls
1	..	37	..	..	.....	Good
2	19	59	..	..	Wired C. C.	Good
3	..	37	..	..	.....	Good

HYOID

1 case.....9 days, median line.

VERTEBRÆ

1 case.....7 days, spinous process.

CASE XIV.—July 28, 1915. G. C., aged thirty. Was found in the mine unconscious. On examination small scalp wound on left temple, bleeding freely from left ear, fracture of petrous portion left temporal; semiconscious, restless, and bleeding for three days;

[1] C. C. is compound comminuted.

then for a week profuse flow of cerebral fluid soaking the dressings. Mental condition improved from day to day and allowed to go home in two weeks.

A few days later we noticed he had a loss of coördination in walking, of a peculiar regular rhythmic zig-zag nature—three steps to the right, three steps to the left, as far as he walked alone, but by being held by the arm he walked straight. He had nystagmus very marked. This condition continued for four and one-half months when we sent him to Dr. Shambaugh in Chicago, and on the second day before examination the zig-zag motion suddenly left. He returned home and in a few days returned to work, but worked but part of one day, when the same trouble returned and continued for a month, when we were arranging to send him to a lower altitude and change of association. The trouble suddenly disappeared. He did not want to go but we sent him, and while away he would have normal days and then a couple of staggering days. He came back and, after settlement with the company, went to work in May, 1916, without any more trouble until January 12, 1917. On that day he worked very hard and at the close of the shift he staggered very badly, nearly falling into a pit. Since then he has been all right. It has been diagnosed hysterical.

CASE VI.—February 6, 1915. S. W., aged thirty. Received a compound depressed fracture of the right frontal bone just in front of the parietal suture. He was not unconscious. The depressed fragment was removed. February 15, late in the afternoon, he commenced having epileptic seizures and by midnight 30 were recorded, when we reopened the wound, slit the dura, passed a probe forward between the dura and brain, when considerable bloody fluid squirted out; redressed with drain. No more spasms and he went on to perfect recovery. It is now two years and no more epileptic seizures have returned.

CLAVICLE

Case No.	Age	Time off	Operated	Results
1	61	48	Wired	Good
2	..	41	.....	Good
3	46	69	Wired	Good
4	24	..	.....	Good

SCAPULA

Case No.	Age	Time off	Operated	Results
1	..	23	Wing	Good

RIBS

25 cases.....average days off, 33.

HUMERUS

Case No.	Age	Time	u/3	m/3	L/3	Operated	Remarks
1	22	117	..	..		Amp. fingers	Radial art. cut off; gangrene of fingers

CASE I.—May, 1911. B. H., aged twenty-two. Engineer on air compressor engine. Elbow and forearm caught between the

bumpers of mine engine and car. Fracture of humerus at junction of shaft and condyles, contusion and laceration of muscles of the forearm, and cutting off the radial artery followed by large blebs on the forearm, gangrene of all the fingers and death of metacarpal bones. Amputation in metacarpal region. The pronator radii teres entirely sloughed out. Results: Good union and motion of elbow. Loss of most of the hand, but good stump. Time, 118 days.

RADIUS

Case	Time off		
1	25	L/3	Styloid	Good result
2	15	L/3	Styloid	Good result
3	36	L/3	Styloid	Good result
4	13	L/3	Styloid	Good result

RADIUS AND ULNA

Case	Time off, 4 Yr.		
1	50	L/3	Colles	Good result
2	50	L/3	2 in. above	Good result
3	57	L/3	Colles	Good result
4	57	L/3	Colles	Good result
5	34	L/3	Colles	Good result

METACARPAL

7 cases.....time off, 20 days average.

PHALANGES

39 cases.....average time off, 18¼ days.

PELVIS

Case	Age	Time off		
1	21	15	Ilium crest	Results good
2	42	30	Spinous process	Results good
3	30	59	Ilium	Results good
4	28	25	Ramus	Results good
5	23	26	Both rami, lap. ruptured bladder	Died
6	..	28	Coccyx	Results good

CASE V.—Was caught between rocks and badly squeezed. Fracture of both rami of ilium, rupture of urethra at base of bladder and at the fundus into abdominal cavity. Operated, bladder closed, drainage. General sepsis. Death in twenty-six days.

FEMUR

Case	Age	Time off	u/3	m/3	L/3	Operated	Functional Results	Anatom. Results
1	21	96	1	..	..	.....	Good	Good
2	30	110	..	1	..	.....	Good	Good
3	27	141	1	..	..	.....	Good	Good
4	40	225	..	1	..	Plated	Good	Good
5	21	113	..	1	..	.....	Good	Good
6	33	269	..	1	..	.....	Good	Good
7	38	586	..	1	..	Plated	Not good	Not good Comp.
8	30	465	1	..	..	Nailed	Not good	Not good
9	52	9	..	..	..	Died, old osteomyelitis		
10	26	123	..	..	1	.....	Good	Good

PATELLA

Case	Age	Time off	Operated	Functional Result	Anatomical Result
1	35	159	Wired	Good	Good

CASE VII.—June 16, 1912. J. E. B., aged thirty-eight. In poor health with profuse purulent expectoration. B. questionable. Fracture at junction of middle and lower third. August 24, apparently good union and sent home. December 11, went to work. December 16, fell off a porch, hurt the leg, but did not rebreak it. January 6, 1913, went to work again, and was not seen or examined until May, 1914, when it was discovered he had a very large callus and a false joint. We then operated, chiseling off part of the callus, cutting off the ends of the bone, bone plate applied. July 29, plate removed due to infection showing up. August 15, allowed to go home with plaster cast on. September 29, readmitted with osteomyelitis of the lower third and only partial or springy union. Operated, diseased portion cleaned out. May 31, allowed to go home with retention splint. August 11, 1915, went to work. Total loss of time, 586 days. Result one and one-fourth inch shortening, partial stiffness at knee, solid union.

CASE VIII.—November 9, 1912. J. C., aged 30. Fractured neck of femur. Treatment extension and abduction. December 31, discharged from the hospital with apparently good union, as shown by examination and X-ray. October, 1913, noticed him walking with a good deal of a limp. X-ray and examination showed no union, with absorption and shortening of neck, with 1½ inch shortening of leg. October 20, operated, capsule opened and found to be partly between the break. This was removed by a bone curette. Shaft nailed to neck with two nails. Plaster of Paris from toes to waist. February 2, 1914, one of the nails had begun to give trouble and both were removed. July 1, 1914, went to work. Total loss of time, 465 days. Results: Functional, good; anatomical, ¾ inch shortening.

TIBIA AND FIBULA

Case	Age	Time	Tib.	Fib.	Int. Mal.	Ext. Mal.	L/3	m/3	u/3	Opr.	Fun. Res. Good	Ana. Res. Good	Remarks
1	35	154	I	I	..	..	I	..	..	.....	I	I	Comp. Com.
2	57	192	I	I	..	..	I	..	..	.....	I	I	
3	25	155	I	I	..	..	I	..	..	Nailed	I	not	C.C. spiral.
4	28	122	I	I	..	..	I	..	..	.....	..	..	
5	38	120	I	I	..	..	I	..	..	.....	I	I	
6	29	77	I	I	..	..	I	..	..	.....	I	I	
7	29	43	I	I	..	..	I	..	..	.....	..	..	Died, T.B.
8	31	114	I	I	I	..	I	..	..	.....	I	I	
9	45	147	I	I	..	..	..	I	..	.....	I	I	
10	31	114	I	I	..	..	I	..	..	.....	I	I	
11	25	225	I	I	..	..	I	..	..	Drilled	I	I	C. C. D. union.
12	43	226	I	I	I	..	I	I	..	.....	I	I	C.C.
13	29	122	I	I	..	..	..	..	..	.....	I	I	C.C.

Case	Age	Time	Tib.	Fib.	Int. Mal.	Ext. Mal.	L/3	m/3	u/3	Opr.	Fun. Res. Good	Ana. Res.	Remarks
14	58	89	I	I	..	..	I	..	..	.....	I	I	C.C.
15	22	132	I	I	..	..	I	..	..	.....	I	I	
16	21	275	I	I	..	..	I	..	..	Amput.	..	..	C.C., ampt.
17	39	51	I	I	..	..	I	..	..	.....	I	I	
18	19	96	I	I	I	I	I	..	..	.....	I	I	Astragalus.
19	47	107	I	I	..	..	I	..	..	.....	I	I	
20	53	90	I	I	..	..	..	..	I	.....	I	I	
21	32	153	I	I	..	..	I	..	..	.....	I	I	Comp.
22	37	84	I	I	..	..	I	..	..	.....	I	I	
23	31	110	I	I	I	..	I	..	..	.....	I	I	
24	40	77	I	I	..	..	I	..	..	.....	I	I	C.C.
25	23	153	I	I	..	..	I	..	..	.....	I	I	C.C.
26	33	196	I	I	..	..	I	..	..	Plated	I	I	C.C.
27	41	120	I	I	..	..	I	..	..	.....	I	I	Comp.
28	32	58	I	I	I	..	I	..	..	.....	I	I	
29	..	66	I	I	..	..	I	..	..	.....	I	I	
30	27	52	I	I	I	..	I	..	..	.....	I	I	
31	38	107	I	I	..	..	..	I	..	.....	I	I	Comp.
32	21	96	I	I	..	..	I	..	..	.....	I	I	
33	45	170	I	I	..	..	..	..	I	.....	I	I	Con. int. joint.
34	35	139	I	I	..	..	..	I	..	.....	I	not	Com. Backward bowing.
35	57	161	I	I	..	..	..	..	I	.....	I	I	Com. into joint.
36	21	101	I	I	..	..	I	..	..	.....	I	I	
37	23	79	I	I	I	..	I	..	..	.....	I	I	
38	39	78	I	I	..	..	I	..	..	.....	I	I	
39	44	122	I	I	..	..	I	..	..	.....	I	I	C.C.
40	28	4	I	..	..	..	I	..	..	.....	Died, inj. to brain.		
41	35	72	I	..	..	..	I	..	..	.....	I	I	
42	25	145	I	..	..	..	..	..	I	.....	I	I	
43	26	140	I	..	..	..	..	..	I	.....	I	I	into knee-joint.
44	30	53	I	..	I	..	..	..	..	.....	I	I	
45	25	148	I	..	..	..	I	..	..	.....	I	I	C.C.
46	..	83	I	..	..	..	I	..	..	.....	I	I	
47	35	22	I	..	I	..	..	..	..	.....	I	I	
48	29	33	I	..	I	..	..	..	..	.....	I	I	
49	..	46	I	..	I	..	..	..	..	.....	I	I	
50	..	60	I	..	I	..	..	..	..	.....	I	I	
51	61	212	I	..	..	..	..	..	I	.....	I	I	Com. into knee-joint
52	45	19	I	..	I	..	..	..	..	.....	I	I	
53	39	90	I	..	..	..	I	..	..	.....	I	I	
54	25	77	I	..	..	..	I	..	..	.....	I	I	
55	24	59	I	..	..	..	I	..	..	.....	I	I	
56	..	25	I	..	..	..	I	..	..	.....	I	I	
57	30	10	I	..	..	..	I	..	..	.....	I	I	
58	35	24	I	..	I	..	..	..	..	.....	I	I	
59	45	101	..	I	..	I	..	..	..	.....	I	I	
60	28	10	..	I	..	..	..	..	I	.....	I	I	
61	29	85	..	I	..	..	I	..	..	.....	I	I	

Case	Age	Time	Tib.	Fib.	Int. Mal.	Ext. Mal.	L/3	m/3	u/3	Opr.	Fun. Res. Good	Ana. Res. Good	Remarks
62	..	49	..	I	..	..	I	..	..	.....	I	I	
63	34	38	..	I	..	..	I	..	..	.....	I	I	
64	..	38	..	I	..	..	I	..	..	.....	I	I	
65	25	83	..	I	..	I	..	..	..	.....	I	I	
66	..	32	..	I	..	..	I	..	..	.....	I	I	
67	50	64	..	I	..	..	I	..	..	.....	I	I	
68	..	42	..	I	..	..	I	..	..	.....	I	I	
69	25	18	..	I	..	..	I	..	..	.....	I	I	
70	30	78	..	I	..	..	I	..	..	.....	I	I	
71	33	25	..	I	..	..	I	..	..	.....	I	I	
72	..	21	..	I	..	..	I	..	..	.....	I	I	
73	30	30	..	I	..	..	..	I	..	.....	I	I	
74	29	30	..	I	..	..	..	I	..	.....	I	I	
75	..	26	..	I	..	..	..	I	..	.....	I	I	
76	30	30	I	..	..	..	I	..	..	.....	I	I	

TARSUS

4 cases.....average time, 90 days each.

METATARSUS

31 cases.....average time, 32 days each.

TOES

70 cases.....average time, 14 days each.

CASE III.—E. P., aged twenty-five. Compound comminuted spiral fracture of tibia and fibula at junction of m/3 and L/3. Loose fragments removed, bones fastened with two 10-penny nails. Functional results good and anatomical results not good, owing to shortening of an inch. Number of days off, 155.

CASE XI.—L., aged twenty-five. Compound comminuted fracture of tibia and fibula; delayed union. Ends of bones drilled. Plaster cast applied and had him walking on it. Functional and anatomical results perfect. Days off, 225.

CASE XXVI.—F. S., aged thirty-three. Compound comminuted fracture two inches above ankle-joint. Tibia dislocated backward. Impossible to hold in reduction. Badly infected, plated fourteen days after injury. Functional and anatomical results good. Plates removed in March. Time off, 196 days.

CASE XXXIV.—C. C., aged thirty-five. Compound fracture of tibia and fibula. Delayed union. Turned loose too soon. Backward bowing. Functional results good; anatomical results not good. Time off, 139 days.

CASE XVI.—F. S., aged twenty-one. Compound comminuted fracture of tibia and fibula just above ankle-joint, followed by bad infection. Amputation below knee six days later. Infection extended up the leg in the knee-joint. Result, stiff knee-joint. Time off, 275 days.

From the foregoing table we glean the following facts: That simple fractures require less time than comminuted, or compound comminuted, in operative cases. For example:

		Average days off	
Tibia	Simple	61	
Tibia	Comminuted into knee-joint	212	Old man sixty-one years.
Tibia	Compound comminuted	148	
Tibia and fibula	Simple	99	
Fibula	Simple	44	
Tibia and fibula	Comminuted	144	
Tibia and fibula	Compound comminuted	169	
Tibia and fibula	Comp. comminuted operated	192	

FRACTURES FROM AN ECONOMIC STANDPOINT

The Company and Hospital have computed the cost of taking care of the injured and find the following results:

For every dollar the man loses in wages by not being able to work, the Company spends a like amount to get him well. The underground worker receives on an average $3.25 a day. When injured his pay stops, but he draws $1.00 per day from the Aid Fund, without any expense to himself for surgical services or Hospital. For example, a man loses 100 days equal to $325.00, he draws $100.00 from the Aid Fund, a loss to him of $225.00 and a cost to the Company of $325.00 besides the loss of efficiency in breaking in a new man. Totaling the 311 cases we have the following losses to the employés and also to the Company:

Fractured bones	No. of cases	No. days off	Loss in wages	Received from aid fund	Net loss to employé	Cost to company
Skull	25	976	$3172.	$976	$2196.	$3172.
Hyoid	1	9	29.25	9	20.25	29.25
Vertebræ	1	7	22.75	7	15.75	22.75
Clavicle	4	182	591.50	182	409.50	591.50
Scapula	1	23	74.75	23	51.75	74.75
Ribs	25	825	2681.25	825	1856.25	2681.25
Humerus	1	117	270.25	117	153.25	270.25
Radius	4	89	289.25	89	200.25	289.25
Radius and ulna	5	248	906.	248	658.	906.
Metacarpal	7	140	453.	140	313.	453.
Phalanges	39	721	234.25	721	1622.25	2343.25
Pelvis	6	183	594.75	183	411.75	594.75
Femur	10	2137	6945.25	2137	4808.25	6945.25
Patella	1	35	113.75	35	78.75	113.75
Tibia and fibula	39	4773	15512.25	4773	10739.25	15512.25
Tibia	19	1322	4296.50	1322	2974.45	4296.50
Fibula	18	800	2600.	800	1800.	2600.
Tarsus	4	360	1170.	360	810.	1170.
Metatarsus	31	992	3224.	992	2232.	3224.
Toes	70	980	3185.	980	2205.	3185.
Totals	311	14919	46365.75	14919	31446.75	46365.75

ON THE NATURE OF NEUROPATHIC AFFECTIONS OF THE JOINTS*

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We are no further in our knowledge of the joint lesions accompanying nervous disease than we were twenty-five years ago. The best expositions of the subject date back to this time; more recent ones have added nothing new and have often left out of consideration facts of importance. Theories and speculation as to the etiology of nervous arthropathies began directly they were described by Charcot in 1868, and continue to this day. The whole discussion turns about the question, "Is the primary cause of these arthropathies to be sought in the nerve-lesion, is the nerve-lesion the primary exciting factor, or is it merely incidental and aggravating?"

Do the nerves exert some mysterious "trophic" influence on the bone, or will an alteration of the normal warning sense of pain suffice to explain the occurrence of osseous affections? Are we to seek the primary lesion in the bones, and to regard the nerve changes as merely incidental, and in certain cases as aggravating, perhaps? Are Charcot joints nothing but ordinary syphilitic deforming arthritides, and the spontaneous fractures of tabes nothing but ordinary breaks made painless by tabic analgesia, or do these bone changes, arthritides and fractures, merely serve as moments (auslösende Momente) inciting processes whose whole course and termination are determined by the accompanying nervous factors, trophic, analgesic, or what not? The problem is involved, it has too many uncertain quantities to admit of clinical solution. On the side of the nerves we have had the question: "*Are* there any trophic nerves?"—and we did not know. On the side of the bones we had the question: "What is a deforming arthritis, what causes it?"—and until recently we did not know. Twenty years ago Klemm, of Riga, recognized the difficulties of a clinical solution and proposed experimental work on the subject; but the time was not ripe. Barth asked how we could hope to explain a neuropathic deforming arthritis, when we did not even know the nature of an ordinary one. Now the last few years have brought us nearer to a solution, we at

*This paper was on the Program of the Orthopædic Section of the 1915 A. M. A. Meeting; a sudden departure for abroad prevented its presentation. Continued absence has made it impossible for me to consider literature later than May, 1915. The first part of the work was done in the Division of Surgery, University of California. The paper was read before the Stanford Clinical Society, October 9, 1916.

least have some knowledge as to the nature of an ordinary deforming arthritis, and have been able to produce it experimentally, and have thus eliminated one of the uncertain quantities. So that I set myself the problem of determining the cause of Charcot joints and went at it from various directions.

Let me first state the questions involved:

1. Are tabic arthropathies due purely to degeneration of certain nerves that cause the bone to atrophy? (Charcot's theory.)

2. Are they simple syphilitic arthritides, occurring sometimes in the course of a tabes, but not infrequently found in the absence of any nerve lesion? (Barré and Babinski.)

3. Are they due to the combined influence of nerve and bone lesions? If so, where does the primary change lie?—In the nerve or in the bone? What is the nature of the nerve-change? Is it merely a lack of sensibility, or is it the degeneration of some nerve assumed to exert a trophic influence? What is the nature of the bone-lesion? Is it an arteriosclerotic deforming arthritis, or a syphilitic one, or one the result of an unfelt trauma?

In order to answer these questions I aimed to produce lesions in cats simulating as nearly as might be tabes in man. I cut a series of posterior roots leading to a particular extremity, enough of them to make a total analgesia, anæsthesia and ataxy. This eliminated many of the factors complicating tabes; the underlying syphilis, for instance. Sections of cords from these cats show an ascending degeneration of the posterior columns corresponding to what would be in man a one-sided tabes (Figs. 1 and 2). Cutting one side only enabled me to have the other as a control. I watched the cats for a considerable period and had the satisfaction of seeing some of them under certain conditions develop what in man would be called a Charcot joint or a tabic fracture.

I then produced joint changes in another series of animals, and after waiting some time, cut the posterior roots, so as to see what effect the nerve-lesion might have on the process in the joint. Then I reversed the order of experiment; cut the roots first, let the cat accustom herself to the anæsthetic limb, and after a month or so induced a deforming arthritis, to see whether this lesion in an enervated joint would immediately assume the extravagant course of a tabic arthropathy. And finally, to refute those who might object that depriving a limb of its sensibility might cause its disuse, and that a possible atrophy might be due merely to inactivity, and not to a trophic nerve influence, I cut three dorsal roots, leading to as many ribs, in a further series of cats. As the ribs were moved along with the movements of their neighbors, there could be no assumption that any trophic change that might be found would be the result of muscular inactivity. All cats were operated on under full ether anæsthesia.

I am indebted to a number of friends for help in this work,—to the

late Dr. Painter, Drs. Howe and Markel for X-rays, to Prof. O'Neill, of Berkeley, for chemical analyses of bones, to Prof. Wing, of Stanford, for tests of tensile strength, to Mr. L. Heynemann, M.E., of San Francisco, for suggesting and giving me an apparatus for the determination of deflection under cross-strain, to Dr. Blaisdell for micro-photographs, and finally to the aid of my attendant, Mr. Moran.

Sixty-nine cats were used for the experiments, and 42 of them were observed for greater lengths of time, from 3 months to over three years. The rest died of intercurrent diseases, sepsis in the anæsthetic limbs, or other complications. After cutting a sufficient number of roots the affected limbs showed the clinical picture of advanced tabes. They were atactic and their muscle-sense was gone. The gait was unsteady, the cats would frequently paw the air a few times before setting the limb to the ground, as though to make sure of its position. Often, in the attempt to make a step, instead of bringing the leg forward the cat would extend it stiffly in all joints, and would drag the limb rigidly after it for a few paces before moving it again. The awkwardness and spasm were atactic, not paralytic. Many of the cats got deep ulcers on the dorsum of the foot from dragging it along the ground. Muscular hypotony was marked; many of the cats walked with an outward rotation of the hip which may have been the cause of the dislocations of the hip-joint noted in some of the animals. Ataxy and atony were less strong in the unilateral resections than in the double ones. For days and sometimes weeks, the cats with bilaterally resected roots would make but few attempts to use their hind-legs. They would hold them extended backward stiffly, and would slide along the floor with their groins and knees touching the ground, as though they did not know that they had hind-legs. They were not paralyzed, however, since they would kick vigorously if lifted by the nape of the neck. The unilateral resections rarely caused bladder disturbances, the bilateral ones were often followed by fecal incontinence, and sometimes by a fatal cystitis. In all successful resections there was complete loss of the sense of pain, both in the soft parts, the skin, and the bone. The periosteum of the affected leg could be pricked with a pin without the cat's evidencing discomfort. The knee-jerk on the affected side was lost. A cross reflex might be obtained by tapping the sound patellar tendon, when both knees jerked, but on tapping the affected tendon no knee-jerk appeared on either side.

Now as to the results of the resections: Nineteen cats with unilateral resections of posterior roots were observed for periods of from three months to three and a quarter years. Of these, two got a fracture of the head of the femur, one a fracture of the great trochanter, three a coxa vara, three had dislocations of the hip, one a fracture of the tibia, one a fracture of the fibular malleolus, one a Pott's fracture, and six showed various lesions about the ankle-joint, fractures of the bones of the foot, etc.; some of these animals had multiple bone and

joint lesions; in six of them no abnormalities of the bones or joints could be found.

Three cats with a bilateral rhizotomy were followed for over six months. Of these one showed an arthritis of both hips with coxa vara, one merely a metatarsal fracture, while the third got a fracture of the head of the femur on one side and on the other a fracture of the middle of the femur, a typical Charcot knee with luxation of the tibia, and a Charcot ankle with fracture of the os calcis.

Sixteen further cats that died of intercurrent disorders could be observed but for a shorter period of from four to ten weeks. Of these two had pus joints, both of them a hip that was dislocated and full of pus, one of them a purulent Charcot knee besides; one of them had a fracture of the neck of the femur, two fractures of the tibia and fibula, five others had tarsal fractures or joint lesions, in five the bones and joints seemed intact, but even of these, two were noted as having but little anæsthesia of the side whose roots had been resected. So, out of thirty-eight cats with disturbances of sensibility of the legs, twenty-seven developed spontaneous lesions of the bones or joints.

It is difficult to know how much stress to lay on changes at the ankle. Disintegration of the metatarsal or tarsal joints and fractures of the bones about them were common, and occurred in fourteen cases out of the thirty-eight; sepsis from an open ankle-joint was a frequent cause of death. Almost all the cats had ulcers of the anæsthetic foot, and it may be that changes at the ankle-joint were effects of the suppuration near by; however, lesions of the hip, femur, knee and tibia being uncomplicated by suppuration, were characteristically neuropathic. It is noteworthy that all the eight joints showing the periarticular ossifications and destructive arthritis typical of Charcot's arthropathies were seats of a fracture that ran into or near the joint.

The mere production, therefore, of these bone and joint changes in healthy animals has disproven some of the theories as to the cause of tabic arthropathies, viz.: the theory of a luetic origin, and that of a primary deforming arthritis.

To see whether there was any change in the composition of the bones following root-resection I had bones from the affected and from the sound side analyzed chemically. They showed no chemical difference. Prof. Wing, of Stanford, was so good as to have tensile strength tests made for me; these, however, presented such technical difficulties and were so full of sources of error that we gave them up, and at the suggestion of Mr. L. Heynemann, M.E., tried measuring the deflection of the bones under a given load, as being easier and giving a more useful criterion of their strength and elasticity. Mr. Heynemann had built for me the little apparatus shown in Figure 14. The ends of the bone are supported by two narrow pieces of metal, over the middle of the bone is placed a hook from which a weight may be

hung. The deflection of the bone under the load of a given weight is measured by the vernier riding overhead on a slotted bridge. Tests both of the ribs whose nerves had been resected as mentioned before, and of the bones of the leg, showed certainly that the bones from the affected side were not weaker than the controls from the sound side. In fact, both these strength tests and the X-ray seem to show that the bone on the enervated side is usually a little stronger than on the sound one. We may assert then, as a result of forty determinations on some thirty-two ribs and fifty-three determinations on various other bones, that there is no osseous *atrophy* produced by a disturbance in conduction along the posterior roots. These determinations make untenable Charcot's theory that a trophic disturbance causing a *wasting* of the bone is at the root of these arthropathies.

Whether there may not be some nerve influence, a "trophic" influence (whatever that may be), that causes a change in the metabolism of the bone, causes it to become more dense, more sclerotic, more liable to arthritis, and more rigid, more liable to fracture, I should not like to say. Especially the case of cat No. 32, where one rib of the three anæsthetic ones was found broken at autopsy, might make one suspect some such factor. There are, however, so many agencies at work in a tabic limb that might produce fractures,—the sudden pull of atactic muscles, the lacking muscle sense which brings the limb into unnatural positions little adapted to resist strain, the anæsthesia and analgesia,—that I do not see why it is necessary to have recourse to the assumption of a mysterious and unproven "trophic" influence in order to explain tabic fractures. The denseness of the tabic bones seen in the X-ray plates might also well be merely a response to added demands, to increased sudden stresses and strains arising from the ataxy, lacking muscle-sense and analgesia previously mentioned.

Some of the cats showed coxa vara, a number of them an obviously traumatic one, but some hips were without the least evidence of fracture or other injury,—it was, however, noted that just these cats walked with rigidly outstretched legs or with an uncertain and wobbling gait, treading now on the sole, now on the dorsum of the deflected foot, so that their varus deformity may as well have been a static one as due to some particular nervous "trophic" cause. In short, there is nothing in our findings that proves the existence of changes in the texture of the bones that may not be accounted for by conditions arising solely from an altered function dependent on a lack of sensibility, nothing in these findings that gives proof of the existence of "trophic" nerves.

We have then to look for the cause of these joint affections in influences due to some combination of both the nervous and the bony lesions. Can we find it in an ordinary deforming arthritis aggravated by a lack of a warning sense of pain? To answer this question I induced a deform-

ing arthritis with the thermocautery after the method of Axhausen, in both knees of thirteen cats, waited for the wounds to heal soundly and the inflammatory reaction to disappear and followed the operation on the knees by a unilateral root-resection. Six of these animals were observed for over four months. In five of them no characteristic difference could be seen in the degree of arthritis on the analgesic and the sound side; one of them (Figs. 6 and 7) developed a typical Charcot knee in the joint which was at the same time arthritic and analgesic. In this cat it was noted from the beginning that the leg was carried awkwardly, with the knee doubled under. This proportion of one cat in six proves nothing, as an equal proportion of cats in the series where the joints were not made arthritic artificially developed spontaneous joint-lesions.

The presence, therefore, of a moderately severe arthritis is not sufficient to make an analgesic joint develop a characteristic arthropathy. Furthermore, we cannot explain the cause of an arthropathy by the assumption of an atrophying influence of degenerated nerves. And finally, we cannot see in these lesions simply an aggravated form of a luetic arthritis. Where have we then to look?

As a companion-piece to the last-named order of experiment I resected the posterior roots in three further cats, and after waiting a number of weeks, opened the joints and seared a spot on the femoral condyles with a thermocautery. *Within three weeks every one of these three cats developed a Charcot joint* with a huge joint hydrops, deformity and grating of the joint surfaces (see Figs. 16 and 17). This, then, was not a slow aggravation of a pre-existing deforming arthritis; it was the sudden response of an anæsthetic joint to the acute trauma of operation, a rapid reaction to bone injury by the production of a typical Charcot joint.

Moreover, it was not only in this last series of experiments, where the limb was purposely subjected to trauma, but in all the experiments as a whole that we find that the cats that were the ones to develop arthropathies, spontaneous luxations of the hip, Charcot knees, or spontaneous fractures were those that did not suffer from operation, those that were lively and active, and we find particularly noted that it was those that held their limbs in awkward and unnatural positions that developed bone and joint lesions. Hence it was the animal most subject to trauma that most often suffered bone or joint trouble. The joint lesions themselves were visibly of traumatic origin, eight of them still showed fractures near the joint, others dislocations such as the joints shown in Figs. 3, 4, 5, 8, 9, 10, 11, 12, 13 and 17. This agrees with clinicopathological observations in man, with the fact that arthropathy is a lesion of *early* tabes, a lesion occurring during the time when the tabetic is still subjecting himself to trauma, and is much rarer in the late atactic or paralytic stage when the patient is weak and confined to

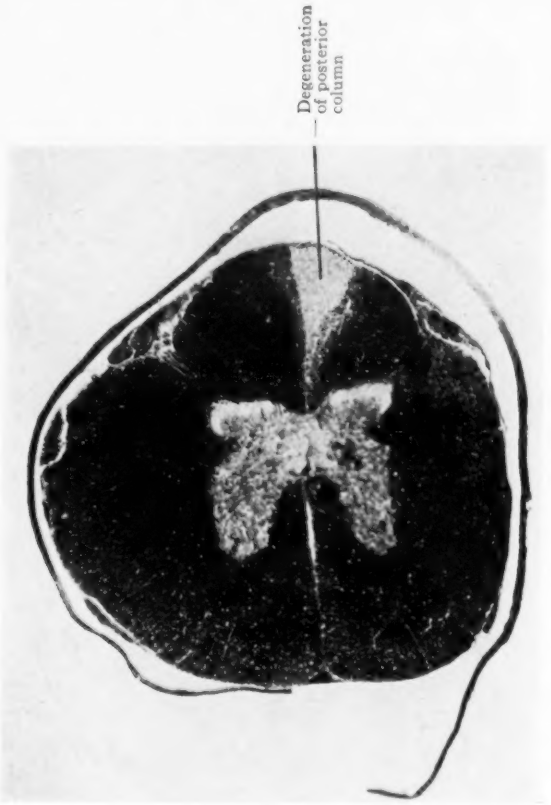


FIG. 1.—Spinal cord of cat No. 33. Weigert stain. Microphotograph by Dr. Blaisdell.

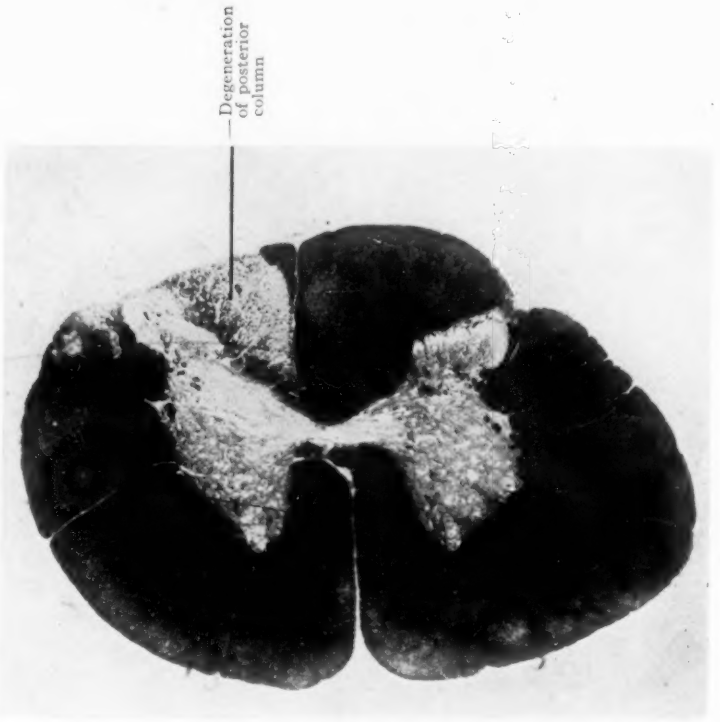


FIG. 2.—Spinal cord of cat No. 48. Weigert stain. Microphotograph by Dr. Blaisdell.

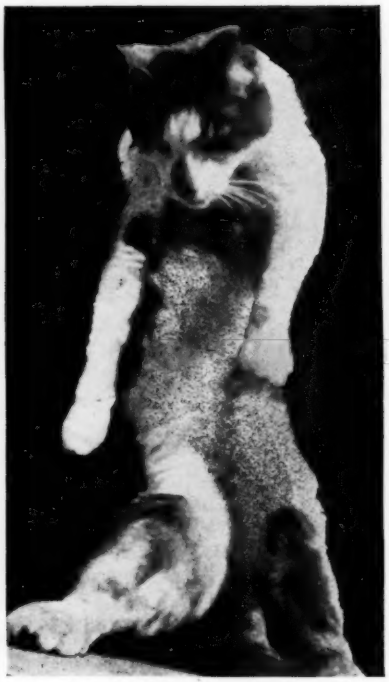
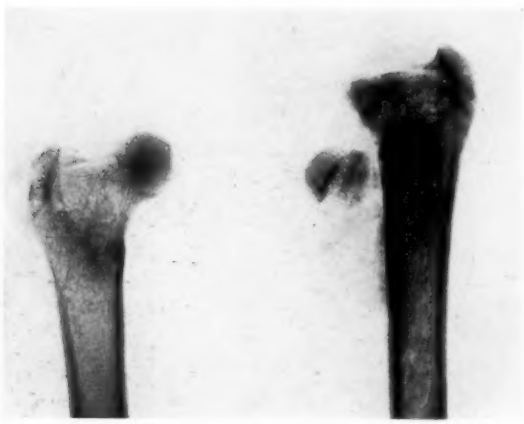


FIG. 3.—Cat No. 52, Charcot knee with dislocation.

FIG. 4.—Cat No. 52 (same as Fig. 3).



A *B*

FIG. 5.—X-ray of cat No. 1. Fracture of the neck of the femur. The bone on the affected side, *B*, is denser than on the sound side, *A*, as was the case in many of the cats with bone and joint lesions.

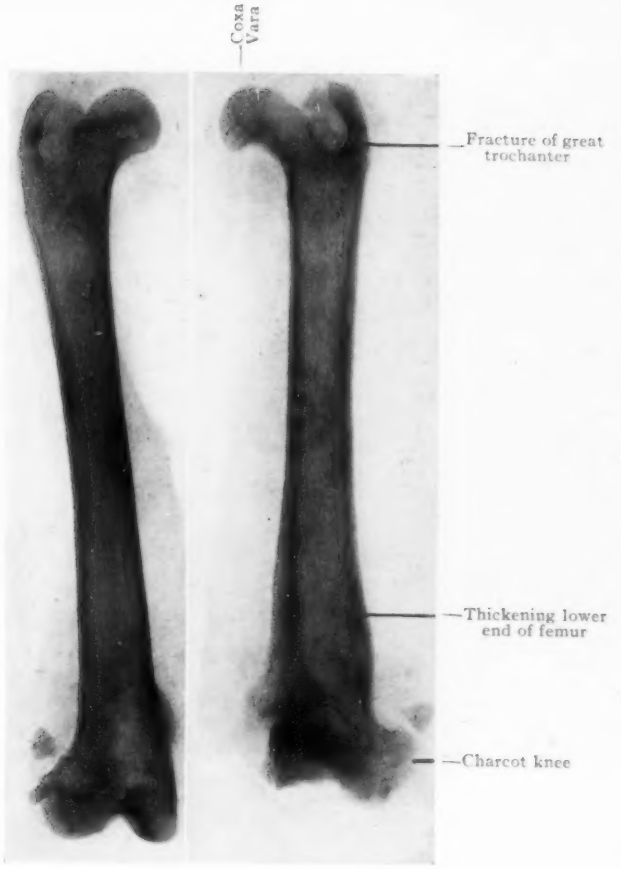


FIG. 6.—X-ray of femurs, cat No. 61. The affected side, *B*, shows coxa vara, fracture of the great trochanter, much thickening of the lower end of the femur and a Charcot knee with marked deformity of the condyles. See photograph of knees, Fig. 7.

FIG. 7.—Cat No. 61. *A*, right femur: Condyles show hypertrophic ossifications and extravagant changes in form incident to Charcot knee. *B*, left femur: Condyles (upper anterior part) show erosions of deforming arthritis after thermocauterization.

FIG. 8.—X-ray of pelvis with dislocation of hip-joint. Cat No. 42.

FIG. 9.—X-ray of ankle, cat No. 25, showing disintegration of the ankle-joint. ("Pied tabétique.")

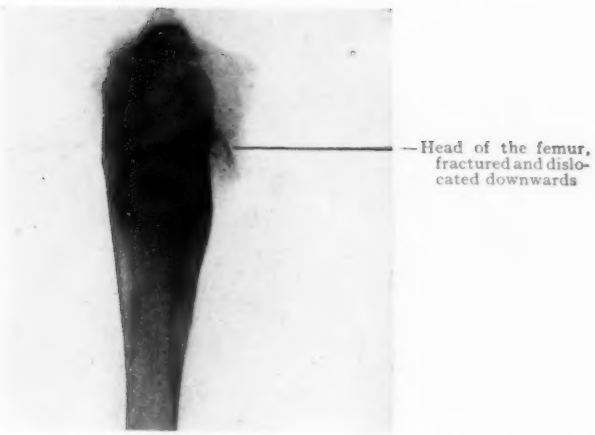


FIG. 10.—X-ray of Charcot hip with fracture of the head of the femur and much thickening of the bone. Cat No. 13.

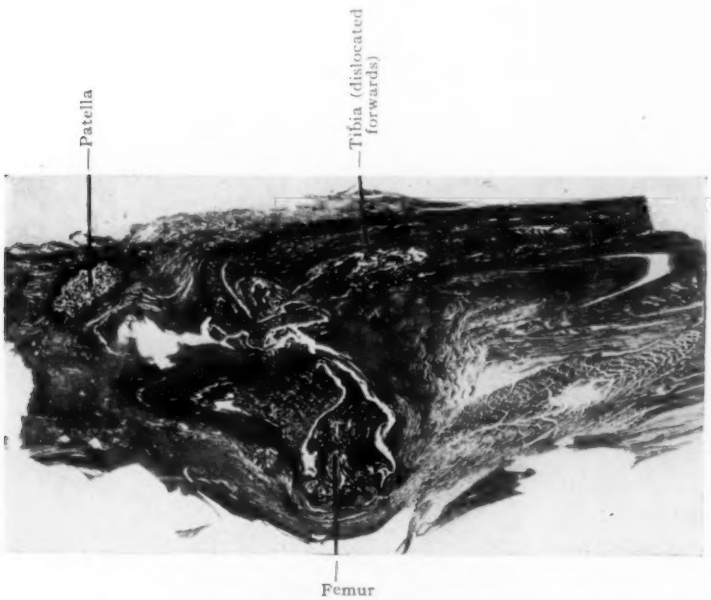


FIG. 11.—Microtome section through Charcot knee with dislocation of the tibia. Cat No. 13.

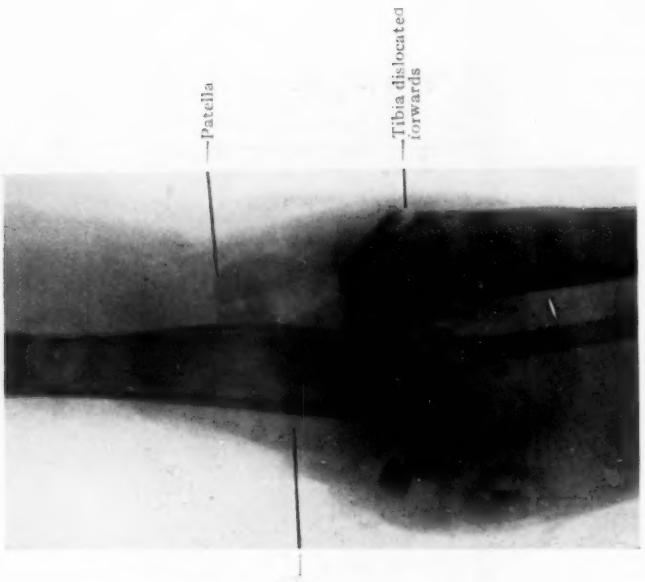


FIG. 12.—X-ray of same joint as Fig. 11.

FIG. 13.—X-ray of pelvis with dislocation of hip-joint. Cat No. 51.

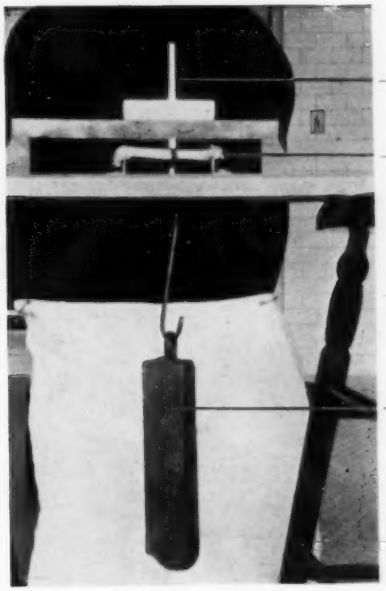


FIG. 14.—Apparatus for measuring deflection of bone under a given load.

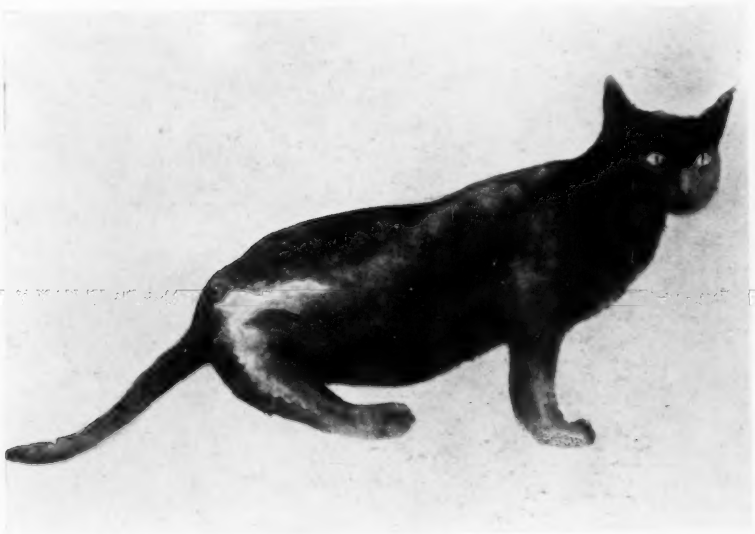
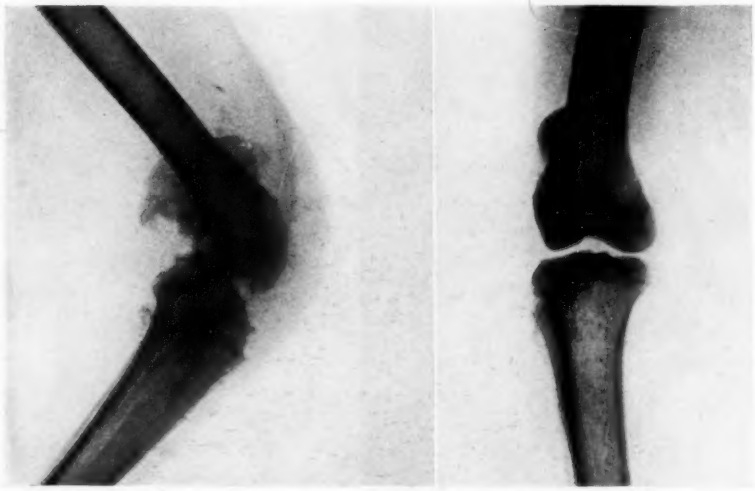


FIG. 15.—Cat No. 48, Charcot knee and eversion of hip-joint (see Fig. 16).

A *B*

FIG. 16.—X-ray of Charcot knee, cat No. 48. *A*, sound side; *B*, affected side.



A *B*

FIG. 17.—X-rays of Charcot knee in cat No. 33. *A*, affected side; *B*, sound side.

FIG. 18.—X-ray of Charcot joint following old gunshot wound of the knee. The blotchy shadows around the joint are caused by lead from the bullet deposited in the tissues of the joint-capsule.

FIG. 19.—X-ray of Charcot joint following subtrochanteric fracture of the femur.

bed. It agrees with the findings in man, where in many Charcot joints we see evidence of old trauma, such as in the case shown in Fig. 18, where a Charcot followed an old gunshot injury; or in the case of a Chinaman in the University of California Service at the San Francisco Hospital, where it followed an evident fracture of the head of the tibia; or in the case of Fig. 19, where it followed a subtrochanteric fracture of the femur. The assumption of a trauma also explains the great para-articular ossifications and proliferating periostitides characteristic of these joints, comparable to the hypertrophic callus that MacEwen found in his fallow deer. All of these are findings inexplicable under the assumption of an atrophying nerve influence, which to explain them all simultaneously would have to be at once atrophying and hypertrophying. The trauma may be slight, but lacking the protecting sense of pain, a simple lesion may turn into a graver one from the added insult of unwholesome use.

I think, therefore, that in the assumption of trauma, grave or slight, plus lack of the protecting sense of pain, we have sufficient explanation for the origin of most Charcot joints.

CONCLUSIONS

1. Bone and joint lesions corresponding to those found in tabes dorsalis may be induced experimentally in the limbs of cats by severing the posterior nerve roots (the sensory fibres) leading from the limb.

2. Severing the posterior roots causes no atrophy of the bone.

3. Tabic fractures and arthropathies have been produced in healthy animals, hence they cannot be ascribed primarily to lues or other infectious causes.

4. The course of a deforming arthritis is not characteristically altered by the addition of an analgesic factor, hence the cause of the Charcot joint is not to be sought in a simple deforming arthritis occurring in a tabetic.

5. Nothing in these experiments gives proof of the existence of trophic nerves.

6. Of three animals whose joints were subjected to operative trauma after having been previously rendered anæsthetic by resection of posterior roots, all rapidly developed Charcot lesions. Trauma in a limb rendered anæsthetic and analgesic experimentally leads to grotesque lesions of the bone and joints, which are in every way the counterparts of tabic fractures and arthropathies; *trauma and lack of the warning sense of pain are the cause of most tabic bone and joint lesions.*

AN ANATOMIC SUBSTITUTE FOR THE FEMALE BREAST

By Willard Bartlett, M.D.
of St. Louis, Mo.

The breast is of such psychic importance to the female patient that it is usually late in the course of breast tumors that the surgeon is consulted. It is the fear of having the breast mutilated that keeps patients away and allows a tumor to run a progressive course.

The physiologic function of the breast, naturally, does not interest the patient. As a general rule, it need not interest the surgeon, on account of the age of these individuals, and thus need not be considered at all.

Therefore our problem is to reëstablish breast *form*, thus satisfying the psychic element, and not to reconstruct a breast of secretory value which must contain glandular tissue.

Bloodgood has recently shown us that a great number of breast tumors are benign and require only the removal of the tumor or breast itself, instead of the radical, complete dissection, which has often been done in the past, under the mistaken gross and microscopic diagnosis of cancer. Without going too far into histologic detail, one must admit that it is impossible in many instances to separate from a diffuse process, breast tumors which in a certain sense are localizable. This is particularly true in cases of fibrocystic mastitis. One can go even farther and state that every operator has been confronted with patients in whom the diagnosis has been so uncertain that it was difficult for him to decide which of the three operations was really indicated, namely; (1) local removal of the tumor, (2) amputation of the breast, or (3) radical complete removal.

The surgeon does not wish to risk general dissemination of a malignant tumor by inadequate local removal, nor does he wish to needlessly mutilate the patient by a complete removal of the breast for a diffuse lesion which could have been equally well removed by a simple glandular extirpation.

It is just these patients who require simple breast amputation for whom I have done the operation proposed herein, thereby avoiding mutilation and at the same time guarding against the dangers incident to local removal, and, on the other hand, allowing a complete detailed study of the gland tissue removed, so that a complete radical operation can be done at a later date without increasing the risk of dissemination. This operation will most frequently be indicated in cases of chronic fibrocystic mastitis, which is generally admitted to be a pre-cancerous condition, hence, an examination of the whole gland must be made before it is possible to state that no part of it is cancerous. This consideration has led me *to shell out the entire gland-bearing area with the cautery*. Cosmetic considerations have led me to fill out the defect with fat taken from other portions of the patient's body.

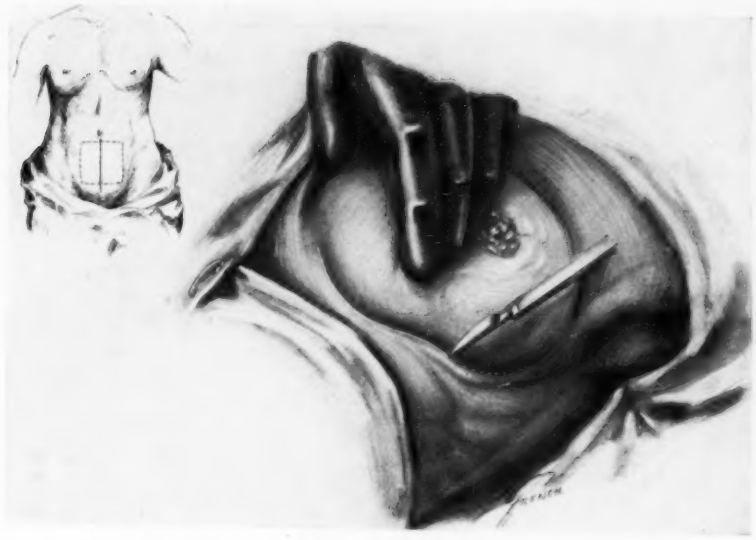


FIG. 1.—Marking the line of incision.

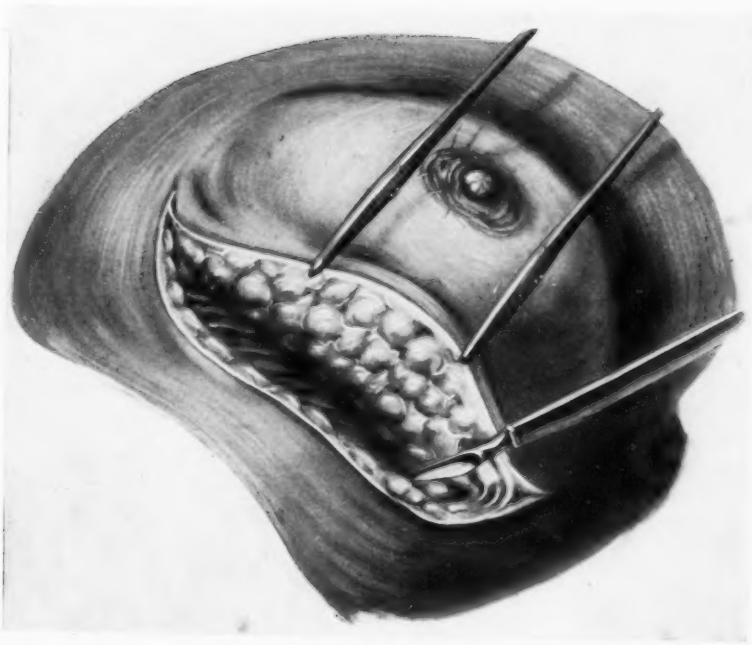


FIG. 2.—The primary incision.

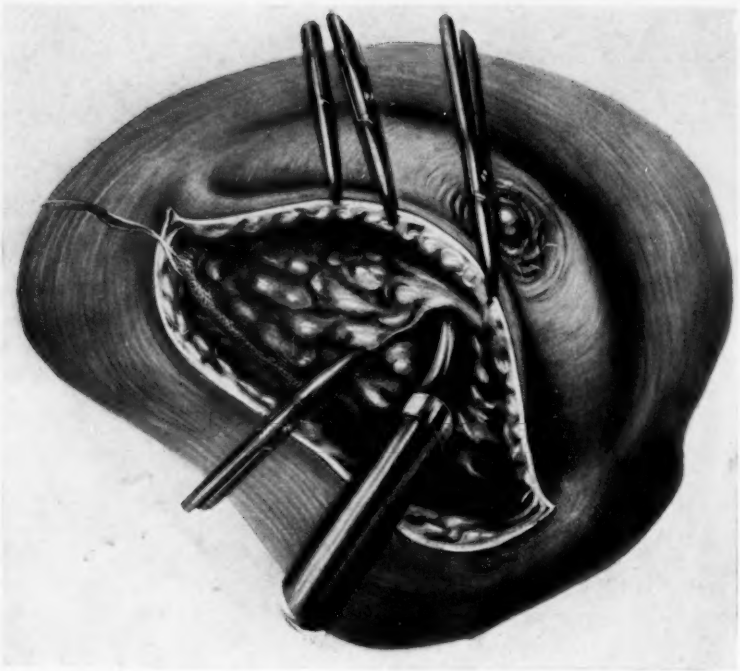


FIG. 3.—The skin covering dissected off the gland.

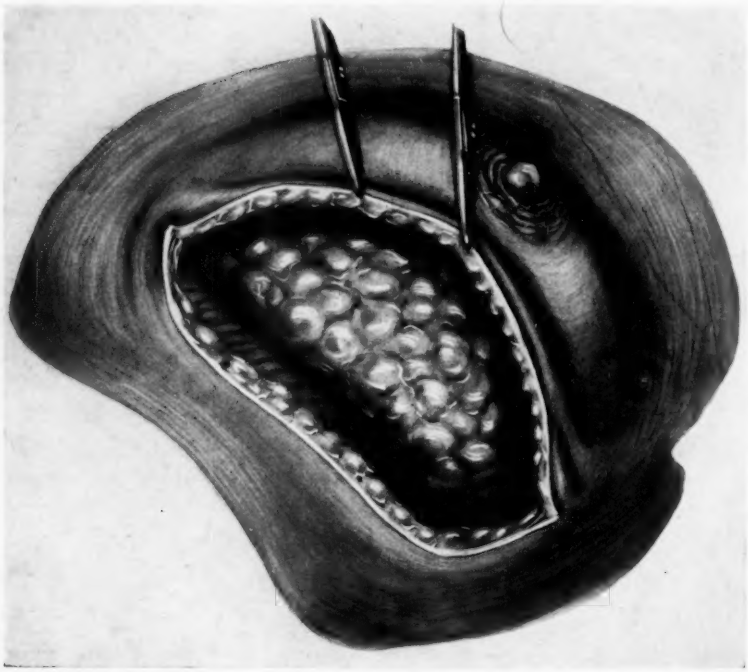


FIG. 4.—The fat transplant in its new position.

The various steps of the operation are given in detail, viz.: (1) With patient in the sitting posture, the affected breast is lifted and a mark made (Fig. 1) in the fold which will be completely hidden by the pendent organ when it is allowed to assume its normal position. (2) Patient is covered with two sterile sheets, attached to the skin in such a manner as to expose two areas; one revealing the affected breast, the other, the lower abdomen or thigh on the same side. (3) A crescentic incision (Fig. 2) is made first below the breast following the line marked out in step (1). The breast is lifted off the chest wall, all attachments being divided with the cautery and the pocket filled with a pack. (4) The skin covering the gland is peeled back with the cautery, (Fig. 3) while downward traction is exerted on the mass to be removed. The natural line of cleavage is found to be close to the skin, but, by using an extremely hot cautery, maintaining only brief periods of contact and always burning toward the gland instead of away from it, it is possible to preserve the skin capsule intact. (5) Hæmostasis is, as a rule, not difficult after using the cautery, but must be made absolutely perfect before the next step can be undertaken. (6) From the anterior abdominal wall, the outer aspect of the thigh, or the buttocks, enough subcutaneous fat is removed to constitute a mass approximately 50 per cent. larger than that which has been extirpated, thus allowing for shrinkage which always takes place. This is to be stuffed into the breast defect and allowed to conform to its new surroundings (Fig. 4). Pads of gauze are meanwhile creating hæmostasis in the defect from which the fat transplant has been removed. (7) The breast wound is then sewn up in two layers, a deep one of catgut reuniting the superficial fascia, and a second one of horsehair, closing the skin. Under no circumstances should any provision for drainage be made. It will not be necessary if hæmostasis has been adequate and it is always dangerous, as it may lead to infection of the depths. (8) The operation is then completed by closure of the skin wound through which the transplant has been removed. It has been my custom to drain these cavities for a few days.

There follows a brief résumé of four of the six patients upon whom this operation has been performed.

Case I.—(No. 6236.) Mrs. S., age thirty. *Present.*—Complains of pain in left breast—one year's duration; subsided at menstruation—completely ceased three weeks ago, when patient noticed a fullness in lower left breast—slightly tender—no redness or local heat—no discharge from nipple.

Past.—Married nine years, mother of two children—nursed both. Seven years ago patient had fissures in this breast which were followed by a mastitis—treated with heat—the tumor has been noticed only one year.

Objective Symptoms.—A single, hard, irregular and tender tumor, size of a lemon, felt low in left breast—movable.

Provisional Diagnosis.—Chronic fibrocystic mastitis. December 5, 1916. The operation described was done; mass size of man's fist removed, and the defect supplied from the outer aspect of left thigh.

Microscopic Diagnosis.—Substantiates the clinical diagnosis. There was slight drainage of fat and serum for a few days, then wound healed normally.

June 22, 1917, more than six months after operation, the condition is more than satisfactory to patient. The substitute breast is about the size of its mate but not quite so pendulous and of firmer consistence. The two nipples look exactly alike.

CASE II.—(No. 6325.) Mrs. C., age thirty-eight. *Present.*—Complains of a " lump " in median portion of left breast for past two years. There has been no noticeable growth of tumor—no pain or any inconvenience.

Past History.—Married fifteen years, two children, nursed both, had a mastitis twelve years ago, treated by massage.

Objective Symptoms.—Multiple tumors size of hazel nut in median portion of left breast, hard, slightly tender.

Provisional Diagnosis.—Chronic fibrocystic mastitis. On February 15, 1917, we did exactly the operation described, and in this case also, filled out the defect with fat from the outer surface of left thigh.

Microscopic Diagnosis.—Substantiates the clinical diagnosis. There was very much drainage of liquid fat and serum in this case and five weeks after operation a phlegmon developed and discharged spontaneously at the lower periphery of the new breast. It was almost three months after operation before the last of several shreds of necrotic tissue were discharged, after which healing was very prompt and the breast was shrunken to about the size of its mate. When last seen, four months after operation, the patient expressed herself as delighted with the outcome.

CASE III.—(No. 6421.) Mrs. L., age twenty-nine. *Present.*—Complains of a small tumor in left breast of two years' duration, fairly rapid increase in size, no pain at present.

Past History.—Mother of two children, nursed both, tumor appeared during lactation of last child.

Objective Symptoms.—A tumor size of a small orange is felt in left upper breast. It is irregular, hard and movable.

Provisional Diagnosis.—Fibro-adenoma of left breast. On April 22, 1917, this operation was done. The defect was filled with fat from the anterior abdominal wall, low in the midline.

Microscopic Diagnosis.—Substantiates the clinical diagnosis. About three weeks after operation, a slight drainage of liquid fat and serum appeared at lower angle of wound. It drained for about one week, the wound then healed very readily. The patient's present condition is well expressed in her communication within one month after operation; " We are very much pleased with your work and grateful for the great consideration shown us."

CASE IV.—(No. 6459.) Mrs. R., age fifty-three. *Present.*—Complains of a sudden pain in left breast. Three days ago breast became hot and seemed larger than the right and was hard. After two days the swelling subsided and patient became fairly comfortable under complete rest in bed. Has no pain now except on palpation.

Past History.—Married thirty years, mother of five children, nursed all five, has had no breast trouble with exception of trauma from corset.

Objective Symptoms.—A tumor size of a small orange in middle of left breast, irregular in shape, firm, movable and tender, enormous development of superficial veins radiating towards nipple.

Provisional Diagnosis.—An acute exacerbation of a chronic fibro-cystic mastitis. On May 25, 1917, the foregoing operation was done with the cautery, the defect filled with fat from the abdominal wall.

Microscopic Diagnosis.—Chronic fibro-cystic mastitis with numerous retention cysts and a local epithelial proliferation.

This patient made a slow recovery, leaving the hospital three and a half weeks after operation, with sloughing of about one-tenth of the fat transplant.

Two of the six patients are still in the hospital, hence a report on them would have no value.

It will be seen from the foregoing that success has marked our efforts, as far as concerns the integrity of the transplant, and this in spite of the fact that infection took place in two of the cases. It can at least be claimed that the patient who looks down at her breast directly or indirectly in the mirror can see no scar at all. No matter what the ultimate shrinkage, she will have accustomed herself to a very gradual change instead of having to experience the shock of a sudden mutilation.

My gratitude is due Dr. Harry T. Upshaw for his kindness in following up the patients whose histories are given above.

TRANSACTIONS
OF THE
NEW YORK SURGICAL SOCIETY

Stated Meeting, held February 28, 1917

The President, Dr. Charles N. Dowd, in the Chair

ANEURISM TREATED WITH THE ANTISPECIFIC REMEDIES ALONE

Dr. William C. Lusk said that in reporting the two cases of wired thoracic aneurism which he showed before this Society on May 10, 1916 (Annals of Surgery, lxiv, 1916, p. 680), he had dwelt upon the importance of giving antispecific treatment to these cases as a measure which, if the disease were not too advanced, could bring relief to their symptoms, could increase their activities and could prolong life. However, he had insisted that to get good results in these cases, the antispecific remedies must be administered according to a definite plan, which had proved satisfactory in his experience and which he believed was applicable to all cases of tertiary syphilis.

The plan was as follows: To give potassium iodide and mercury for from four to six months before any salvarsan was given. Thus the gummatous infiltration in the aorta was first controlled, which preliminary preparation seemed to give an especial impetus to the action of the salvarsan, since when the latter was then given the improvement in the symptoms was marked, cough and tracheal obstruction were lessened, pain could be expected to disappear, and the patient became possessed of a sense of well-being and acquired a capacity for greater physical effort. Potassium iodide was given in doses of ten grains three times a day and mercury generally by injections of the salicylate not to exceed one grain every five days, interrupting these drugs as occasion required. Before giving salvarsan the potassium iodide must be stopped, since, when potassium iodide had been given following salvarsan, it had seemed sometimes to have caused pain, and, even for months afterward, to have been particularly prone to excite cough. Potassium iodide appeared to supply a real want in the early treatment of thoracic aneurism, but when it had once been given for a long period of time prior to the salvarsan, as here recommended, any subsequent usefulness of this drug had seemed problematical. It had seemed very important that mercury be given between the doses of salvarsan, to the beneficial effects of which thus administered the patients themselves would bear testimony. The salvarsan, or diarsenol, 0.3 gram was given about once a month, being guided as to the number of injections partly by the Wassermann reaction and partly by the effect of the treatment on the control of the symp-

toms and on the activity of the patient. When, with a lapse in treatment of a thoracic aneurism, symptoms recurred for which further treatment became necessary, it had seemed best to administer mercury alone for a while before giving the next dose of salvarsan. Mercury should not be given within five days before, or five days after, salvarsan. The urine should be watched.

More lasting benefit in the treatment of tertiary syphilis had seemed to come with the use of old salvarsan or diarsenol, consequent upon a preliminary treatment with potassium iodide and mercury, than with neosalvarsan (*vide* cases 1 and 3).

Cases of thoracic aneurism touching the chest wall, which were suitable for treatment with the antispecific remedies alone without wiring, were those without much recess formation in their contour, indicating an absence of great stretching with thinning of the aneurism wall in any particular locality.

CASE I.—V. K., age thirty-seven, laundress, referred through the courtesy of the late Dr. A. A. Smith, at Bellevue Hospital. Onset in January, 1914, with pain, which became severe, but the following June disappeared, leaving a soreness. In March, 1914, she lost her voice, and the following August she had her first choking attack in which her throat was full of "rattles," evidently a bronchorrhœa, which was relieved by a hypodermic injection. She had six of these attacks before entering Bellevue on September 29, 1914, where she was put to bed and given potassium iodide in moderate doses and injections of mercury salicylate. In December, two weeks after an interruption of her potassium iodide, she developed a very bad attack of obstructed breathing with bronchorrhœa, but on giving potassium iodide again in ten-grain doses, the acute symptoms left. After her preliminary treatment with potassium iodide and mercury she was given in the spring of 1915 four injections of neosalvarsan 0.45 with mercury salicylate in between. She left Bellevue July 4, 1915. Wassermann, September 30, 1914, six units; January 30, 1915, fifteen units; the following June 9, two units, and August 18, negative. In August, 1915, she was able to walk three ocks before she would have an attack of hard breathing, which latter would disappear on resting. She had regained her voice. During that summer she gained twenty pounds, but her health continued precarious, and in the fall she began to have dyspnœic attacks again, with pain and throbbing, irrespective of exertion. Potassium iodide in five-grain doses now increased her cough and expectoration, and after a short trial was discontinued. She was given a few injections of mercury. On November 22, 1915, she had a severe attack of tracheal obstruction, and she re-entered Bellevue Hospital. Wassermann, fourteen units. Potassium iodide, tried again, once more increased cough and expectoration and had to be stopped. She was given injections of mercury salicylate, under which she improved so that she was able to walk about the ward without distress in breathing. On January 18, 1916, she caught cold which was followed by a series of attacks of labored breathing from pressure on the trachea, accompanying which the superficial

veins on the front of the chest would become distended. It was found that these attacks of shortness of breath would become relieved in a few minutes accompanied by a diminution of expectoration and cough, following a hypodermic injection of ten minims of adrenalin. The blood-pressure was low. Between January 22 and 29 it varied from 105 to 118. A few doses of 1/150 grain atropin were also given and the patient improved somewhat. Marked improvement, however, followed the giving of a dose of neosalvarsan 0.45 on January 29. Just before receiving this medication the only position in which the patient could sleep was on her back with her head turned to the left side. Any attempt to lie on either side would produce hard breathing and choking. On January 30, the day following the giving of the neosalvarsan, the patient passed a very comfortable day and slept the greater part of the ensuing night. On January 31 the patient coughed but little and began to rest some on her sides; and by February 5 she was able to rest with comfort on either side.

The patient continued to improve. On March 17, 1916, she was given diarsenol 0.3, and on May 4 she was given of the same drug, about 0.24. She left Bellevue the middle of May, at which time she could walk and stand around the ward a good deal of the time with perfect comfort. She then had no shortness of breath unless she hurried. She could sleep in any position. She coughed very little. During all of this time that she was in the hospital she received mercury either in the form of the salicylate or by inunctions. She has a peculiar reflex, in that whenever she gets an injection of mercury she immediately becomes nauseated and remains so for from twenty-four to thirty-six hours.

Since the patient had the diarsenol in the spring of 1916 up to the present time she has had no serious relapse. Once last November she caught a cold which was accompanied by a little shortness of breath, but this soon disappeared. On Labor Day she walked twenty blocks without any ill effects. She has been employed during the winter as secretary, at which occupation she works from two to six hours a day. She walks generally four long blocks a day and climbs two flights of stairs to her room. She has had no chronic cough since last spring. Two days ago, wishing to indulge herself in a long walk, she covered in different stages about two and one-half miles without any trouble. She occasionally sings in the choir. She has taken some mercuric potassium iodide pills, one-sixth of a grain during the fall and winter. Wassermann, taken on November 14, 1916, was five units, cholesterin antigen. An X-ray taken February 26, 1917, compared with one taken May 8, 1916, shows that the transverse measurement of the aneurismal shadow has not changed.

Observations.—After this patient had been given neosalvarsan, whenever resort was made to potassium iodide, the latter always aggravated her cough, so that finally it was stopped, and afterward she made her final recovery with mercury in combination with one injection of neosalvarsan and two of diarsenol. While the patient made

some temporary improvement following the four injections of neosalvarsan given in the spring of 1915, the beneficial effects of this drug were not lasting, her health continued to be precarious, and before long she suffered a serious relapse. Since she has had the two doses of diarsenol last spring she has not had any serious relapse (now nine months), and she has had much more activity and comfort than she had before and has been able to enjoy life. It does not seem possible that the patient would have reacted from her condition of very acute tracheal obstruction in January, 1916, without the magical influence of the neosalvarsan, coming as it did in sequence with her prior antispecific medication.

In explanation of the sudden attacks of tracheal compression which occur in these cases with relief following a hypodermic of morphine and atropin or of adrenalin, the writer has stated elsewhere [1] his belief that they are due to a mediastinal œdema.

Case II.—H. W., age forty-six, druggist, even enlargement of aortic arch. Onset with cough in December, 1914, followed by pain on exertion; slightly harsh breathing characteristic of a mild tracheal obstruction, and slight huskiness of the voice. There has never been any pulsation which could be felt transmitted through the chest wall. Beginning July 2, 1915, up to February 15, 1916, he was given five injections of salicylate of mercury of one grain each, four injections of three-quarters of a grain each and twenty-nine injections of one-half a grain each. For five months prior to December, 1915, he took potassium iodide in ten-grain doses with an occasional short interruption. In December, 1915, and January following, resort was again had to potassium iodide in five-grain doses on two occasions, but both times the cough became so aggravated that this drug had to be stopped. This was before any salvarsan had been given. It has seemed that when potassium iodide has been given over too long a period of time, even though salvarsan has not been taken, cough will result, as if to express that the limit of tolerance to this drug had been reached. On February 25, 1916, the patient was given neosalvarsan 0.45, and since that time he has been given diarsenol 0.3 four times, 0.2 once and 0.25 once, with thirty-three injections of salicylate of mercury one-half a grain each and mercurial inunctions for six weeks during the early part of the summer. On August 29, 1916, his Wassermann was fifteen units positive cholesterin antigen, and + + + alcohol antigen. On December 20, 1916, his Wassermann was 10 units positive with cholesterin antigen and negative with the alcohol antigen, this reduction in the strength of the Wassermann reaction having followed the giving of 3 injections of diarsenol 0.3 at intervals of a month, with injections of mercury salicylate once in five days between.

This patient has never suffered very acutely. His activities were limited for a long time by the occurrence of pain and shortness of breath on exertion. He consequently was inclined, while thus affected, to stay in his room. The cough has been the thing that has been promi-

[1] Annals of Surgery, lxiv, 1916, p. 691.

nent in his case and that has not generally been very distressing. It has been for the most part dry and evidently of a reflex character since it has been influenced by the position of the body. Up to early in January, 1917, if he would lie on his back or his right side he would cough, but he could lie on his left side without coughing. Latterly he has been able to lie in any position in bed without coughing. Up to the time of receiving his neosalvarsan on February 25, 1915, the patient had improved to a certain extent but his activities were very limited. The huskiness of his voice had disappeared. With the subsequent treatment with neosalvarsan, diarsenol and mercury the patient has gradually gained in strength and activity, and his symptoms have almost entirely disappeared. The patient has walked about three miles comfortably on each of the past three Sundays. Since stopping his antispecific treatment on January 8, 1917, he has since improved a good deal. At the present time he coughs but little and that only in the morning on rising and when he moves about. His breathing is a little hard only when he walks uphill. He is working again about three hours a day. Following the neosalvarsan and each injection of the diarsenol the improvement of the patient was quite noticeable and the patient always claimed that after each injection of mercury given in between times he likewise experienced a certain benefit. It was following his last injection of diarsenol on December 20, 1916, that he claimed to have been partially relieved of a feeling of pressure in the head and neck which the previous injections of this drug had not done, and that he breathed a great deal easier. X-ray pictures of this patient taken at the beginning of treatment and before and since neosalvarsan and diarsenol have been given show that the size of the aneurismal shadow has remained the same.

Case III.—B. F., aged 43, aneurism of left dorsolumbar region. Referred by Dr. S. Bradbury. Pulsation distinct though not forcible over region of eleventh and twelfth ribs about 2 inches from the vertebral spinous processes. Pain in the left side has been the prominent symptom. The patient sought hospital relief in December, 1913. In the hands of others within the first six months he states that he was given six injections of neosalvarsan and a great deal of potassium iodide. At the end of this treatment he stated that he had not been relieved of his pain at all. Thus from the writer's standpoint the treatment of this case was begun quite contrary to what might be expected to produce a satisfactory result. In the summer of 1914 he came into the writer's hands. He was suffering pain which prevented him from standing or sitting erect. He was given mixed treatment for about ten weeks with some relief for a while, but with later intensification of the pain. Then between October 21, 1914, and February 3, 1915, he was given 6 injections of neosalvarsan 0.45 and 16 injections of mercury salicylate. After each injection of neosalvarsan there would be some relief to the pain with more or less return of it soon after. In March and the first half of April, 1915, he was entirely free from pain but afterward the pain began to return. At this time he had not been working and had done little walking. He then went

into other hands again and was given considerable potassium iodide which did not help his pain any. The middle of August, 1915, he was again seen by the writer. With slight exertion he would have pain in his left groin and inner side of left thigh. Wassermann negative. He soon disappeared again and turned up August, 1916. For nine months previous to his return he had taken 5 drops of potassium iodide three times a day. Though there had been some variation in the amount of pain, he had had very little relief throughout the year.

What seemed finally to have given this patient more lasting relief from his pain under conditions of limited activity than had any of his former medication, was an injection of diarsenol 0.3 given on September 25, 1916, which was preceded by, and followed by, 5 injections of mercury salicylate grain I. The immediate improvement following the diarsenol injection was much more marked than had that ever been following an injection of neosalvarsan. The patient then left town and was not seen again until February 21, 1917, when he reported that since the end of October, as long as he had been inactive, he had not noticed the pain, which had been inconsequential. He could walk one or two blocks slowly without exciting pain. He could stand perfectly straight. He could sleep in any position. Pulsation was now difficult to detect. This experience would argue in favor of a preference for diarsenol to neosalvarsan. It is of interest that the Wassermann on September 18, 1916, was only 1 unit positive with cholesterin antigen, yet the symptoms, at that time uncontrolled, became greatly relieved following the giving of the diarsenol in conjunction with mercury.

Just after rendering the above favorable account of himself, while returning home in a trolley car, for no assignable reason, the patient had an attack of pain as formerly, which disappeared after a considerable rest, since which time the pain has recurred with only slight exertion such as walking around his room, and he can now lie only on his right side with comfort. The pain is however not so great as it used to be. It now passes around both sides of his body. There is no evidence of physical change in the aneurism.

Case IV.—W. H., age 58, laborer, referred by Dr. E. M. Raynor. Admitted to Bellevue Hospital October 19, 1916. Mesial thoracic aneurism of arch extending upward laterally to beneath the right clavicle and projecting prominently above the sternum, besides bulging to the left. In February, 1916, a lump began to grow in the neck and hoarseness developed. He had been short of breath on doing hard work and walking upstairs for about a year. If he lay in bed on his left side he would cough and have pain. When up, pain was excited only by working. Not much expectoration. Taking it easy he could walk about a mile without trouble. Some dysphagia. Would cough considerably on drinking water. Wassermann 15 units cholesterin antigen and $++++$ alcohol antigen.

Treatment.—Since the patient has been in Bellevue Hospital he has had 9 injections of mercury salicylate of 1 grain each and 11 injections of ¾-grain each. He was at first given potassium iodide in 10-grain doses for about ten weeks and a comparison of the X-rays

taken before and after showed no perceptible change in the size of the tumor. Then wishing to determine whether potassium iodide given in increasing doses might not diminish the size of this aneurism, on January 9, 1917, this medication was started, and, increasing the dose 3 grains each day, the potassium iodide was run up to as high as 82 grains three times a day. When this latter medication was started the patient was recovering from an acute cold so that he was then coughing more than usual. The cough continued during the time of taking the intensive doses of potassium iodide with greater severity than ever before, and finally it became so bad, keeping the patient awake, and the nose ran so profusely, that this drug was stopped, following which the cough soon entirely subsided excepting when he drank water. An X-ray taken about three weeks after stopping this heavy dosage with potassium iodide showed no evident change in the size of the aneurismal shadow. At the present time swallowing is easier; he does not cough so much when he drinks, and the voice is much stronger, the latter improvement having taken place particularly since about the middle of January. He walks around the ward with a good firm tread, but gets short of breath if he hurries too much.

Observations.—This patient was presented at the end of his iodide and mercury treatment to emphasize the fact that this preliminary treatment with the older remedies should precede the giving of old salvarsan or Ciarsenol. Also to demonstrate the results of this preliminary treatment, *viz.*: No apparent change in the size of the aneurism, indicating that at least growth had not taken place, besides considerable improvement in general health, yet without restoration of much activity and vim, which latter would now be expected to supervene in this case with the giving of old salvarsan supported with mercury. (A Wassermann taken March 7 was still 15 units and + + + +.) Added severity of the cough and coryza produced by the giving of large doses of potassium iodide are conditions which must be very undesirable in a case of this sort, both from the extra strain put upon the diseased aorta as well as from the loss of sleep entailed. This case, with its extensive recesses on either side and upward, is one for which the wiring operation would seem to be indicated in the near future.

Dr. Willy Meyer said that a review of the means at the surgeon's disposal for the treatment of aneurism showed that they had nothing else so far that showed somewhat permanent results except antispecific treatment in combination with wiring.

The one case reported by Dr. Lusk, who has lived four years up to this time, is most striking and most instructive. The speaker could recall one case seen by him, who was afterwards wired in Baltimore. The man lived for a year and one-half afterwards in apparently good health. Another case, a man above fifty years of age, who was absolutely bedridden on account of a large aneurism of the ascending aorta, was wired by Doctor Meyer in 1913 at the German Hospital. That man was very much improved so that he was able to walk upstairs, four flights, to his bedroom. He lived

almost one year, when he died suddenly while talking to his wife. In another case, which was subjected to wiring about one year ago, the man lived for eight or nine months. The postmortem showed that comparatively little wiring had been introduced into the anterior portion of the sac. He had seen cases where very small aneurisms had occasioned great trouble. He had had under his care two men who had died from suffocation, in each of whom at autopsy a very small aneurism was found which compressed the trachea and one bronchus. How can one help such cases in which only radiography can establish a definite diagnosis? For wiring, the sac must be adherent to the thoracic wall at least in one place. In a case of this type, in which the X-ray showed an intrathoracic tumor, but which was nowhere adherent to the chest, he opened the thorax and found a place where it was adherent close to the spine. Upon the skin over this point a mark was made with a knife and the wound was closed. This preliminary procedure was conducted under intratracheal insufflation of ether. He developed pneumonia, from which he died, so that they did not get so far as to wire him.

Since having seen Dr. Lusk at work, he had admired especially his patience and perseverance. To prepare the wire takes a long time in order that the coil may assume the same size inside the sac, after it has been passed through the needle, as it had outside. Dr. Lusk uses his fingers and works and works for hours, for days often, until he has brought the thirty or thirty-five feet of wire to that condition which will cause it to keep the desired coil.

Dr. Meyer in his second case, about one year ago, having seen the amount of work required felt unwilling to impose upon the kindness of his colleague to help him again prepare the wire, so he consulted a dentist friend who was an ingenious man. He, Dr. Kauffer, suggested to wind the wire around a bottle of the desired diameter, which had been covered with asbestos to protect the glass. Then he passed an electric current through it, governed by a rheostat, in a strength just enough to make a cherry-red heat. After the wire has cooled off, when it is taken from the bottle, it will hold its size absolutely; it can be drawn up or down or treated in any way, and it retains the coils desired. This is quite an advance technically because if the hospital has many of these cases the house staff will be kept very busy to prepare the wire after the old plan. The electric current does not interfere with the strength or the resiliency of the wire. The wire costs about one dollar per foot.

ENUCLEATION OF CLOT IN HEMIPLEGIA

Dr. Alfred S. Taylor referred to the article of Hudson, published in 1913, Annals of Surgery, lvii, 492, on the treatment of hemiplegia, in which he advocated the procedure to enucleate the clot from the internal capsule, thereby sometimes saving life in the extremely acute cases, and in any case hastening the recovery. Since in any hemiplegia the damage is of two types, the permanent paralysis due to the actual amount of brain tissue destroyed

by the rupture of the vessel and the secondary damage which is due to the pressure of the blood clot upon surrounding structures, it seems reasonable to infer that if the clot could be evacuated recovery would necessarily be more rapid and more complete. He had tried to get some early cases, but had succeeded in getting only one. However, he had had two or three of the older cases in which the results had been interesting, and, in illustration of the result of the attempt to treat hemiplegia in that way, he presented a girl, 16 years old, who in October of last year, 1916, fell upon the street and was unconscious for three hours. She was taken home and after three days was taken to Willard Parker Hospital as a suspected case of poliomyelitis. It was noted, however, that she had a left hemiplegia. At that time, in Willard Parker, a Wassermann on the blood and the spinal fluid was negative. She was discharged from the hospital after about two and a half months with a well-marked hemiplegia.

On January 8, 1917, she entered the Hospital for Ruptured and Crippled. Her systolic pressure was 115 mm. and her diastolic was 85 mm. The urine was normal, nothing could be found in the heart or lungs that was abnormal and no cause could be made out for the occurrence of the hemiplegia. The eye grounds were normal, the blood Wassermann was negative, the spinal fluid was clear, showed one cell to the field, and contained no globulin. Spinal fluid Wassermann was negative.

The left side of the face showed distinct weakness, least noticeable about the eye. The left triceps, biceps and wrist reflexes were markedly exaggerated. There was distinct loss of power in the left upper extremity but not complete paralysis. There was marked spastic contraction in the elbow, wrist and fingers and it was difficult to straighten the joints without the use of undue force. Attempts to elicit the knee-jerk in the left side caused patellar clonus, which was rapid and persistent. Ankle clonus was present but not marked. Babinski suggested in the left foot. The tongue deviated slightly to the left. There were no sensory changes.

On February 8, 1917, operation under ether was done at the Hospital for Ruptured and Crippled. A right-sided subtemporal decompression was done. The bone was removed over an area about 7 x 5 cm. The dura was tense, but pulsation could be made out. The dura was split by a crucial incision and the brain immediately protruded 1 cm. The brain surface was markedly congested and the pia-arachnoid was cloudy. The veins in the sulci were distended.

Palpation revealed no localized resistance.

A Cushing needle was passed perpendicularly into the first temporosphenoidal convolution 1 cm. behind the lower end of the fissure of Rolando. At a depth of 1.5 cm. it encountered increased resistance and after being pushed in slightly farther it evacuated a fluid which was more viscid than ventricular fluid and somewhat yellowish, soon becoming blood-stained. While waiting for a sterile tube the flow ceased. The needle pushed in slightly further evacuated about 6 c.c. of ventricular fluid.

The needle was withdrawn and through the same cortical puncture was passed in an upward direction at an angle of 45 degrees. The same increased resistance as before was noted at a depth of about 1.5 cm. and persisted until the needle had been inserted an additional centimetre. No fluid was evacuated this time.

The needle was withdrawn and along its track was inserted an endoscope 22 Fr. into the indurated area. The obturator was withdrawn and an electric light attached. The tissue at the end of the endoscope was dead white. There was no bleeding, but at the end of a few moments a thin blood-stained film covered the exposed surface. The tissue showed no tendency to crowd up into the lumen of the tube in spite of the increased brain tension previously noted. Inspection continued while the endoscope was withdrawn, and where the indurated tissue ceased at about 1.5 cm. below the cortex, the brain substance became more vascular.

The dura was left wide open, and the remainder of the wound closed by layer sutures of catgut, chromic gut and silk. She left the table in good condition and at no time had shown any signs of shock or depression. The maximum temperature after operation was 99.6. The wound healed by primary union.

February 10 (2 days after operation) the arm, wrist and hand fall straight out on the bed from their own weight. The spasticity is entirely gone. She can voluntarily flex and extend the elbow, wrist and fingers, although there is not much power. The exaggerated reflexes at the triceps, biceps and wrist have disappeared. In the lower extremity the knee-jerk is still much exaggerated but the patellar clonus has disappeared. There is no ankle clonus.

Dr. Taylor presented also a man who had been under treatment at the Fordham Hospital. He had had a sudden hemiplegia, suggesting a hemorrhage in the internal capsule. As a matter of fact, it turned out afterwards that his primary attack, which began on the first of March, 1916, had been preceded by a gradual loss of the use of his right upper and lower extremities. In other words, it had been a gradual, progressive hemiplegia.

At last he became unconscious, developed motor aphasia and complete loss of power of the upper and lower right extremities. On April 5, 1916, five weeks after his hemiplegia, an exploration of his left motor cortex was done because of his hemiplegia and aphasia. No increased pressure was found, but rather a diminution in cerebral pressure. At the site of the speech area the brain was distinctly soft, and on puncturing it with the aspirating needle a fair amount of what looked like melted fat exuded. Of course there was nothing further to do. They had a decompression already, and simply closed the wound expecting to get little or nothing as a result.

However, very promptly after the operation he began to improve in a number of ways. Before operation any attempt at speech, no matter what he wanted to say, simply resulted in blub, blub, blub, blub. After he'd do that for a moment or two he'd start to cry because he couldn't express himself.

Before he left the hospital, which was only three or four weeks following his operation, he still could not speak, but he could almost articulate. He was

approaching the time when he could speak. He has been at the Montefiore Home since and has learned to walk fairly well and Dr. Strauss, on whose service he is, reports that he can talk moderately well.

CARCINOMA OF THE THYROID

Dr. John Rogers remarked that cancer of the thyroid had been, in his experience, comparatively rare. He had records of only about one dozen cases. Three of these were in people under thirty years of age. The disease has, in each instance, presented quite definite characteristics, and there were two varieties. In one, the carcinoma seemed to have developed extensively throughout the greater part of a long-standing simple goitre. In the other group it apparently originated and remained in some localized portion of an otherwise healthy gland.

In the first group, with diffuse thyroid involvement, the lymphatics became enlarged early and were hard like the primary tumor, which was always hard and nodular and painful, but not tender.

In the second group, with the cancer well encapsulated and sharply definable from the surrounding normal gland tissue, the disease has felt very hard and nodulated, and the lymphatics have been involved very late. More or less pain has been noticeable.

He then presented a man thirty years of age, who first noted a tumor low down in the left side of his neck last fall. Within the last four months it increased quite rapidly in size until at the time of operation, February 11, it was about three inches in diameter. The pre-operative diagnosis was probable carcinoma of the thyroid.

The excision of the tumor through a transverse incision was carried out under local anæsthesia (½ per cent. cocaine) without difficulty. The tumor was surrounded by a dense capsule which enabled it to be readily trimmed out of the lower pole to the left thyroid lobe. The remainder of the gland appeared perfectly normal both to sight and touch, and no lymphatic enlargement could be detected, and, therefore, the apparently sound thyroid gland was not disturbed. Only the diseased portion was excised, and that, too, quite close to its dense fibrous capsule.

He believed the tumor to be cancer at the time of operation, but did not think excision of the whole gland was justifiable (*a*) because the disease seemed entirely confined to the tumor and (*b*) because if it had escaped into the gland it had just as probably escaped into the general circulation. Fortunately, the final report of the pathologist, though not quite definite in some respects, is quite definite against the presence of true cancer.

CORNEAL ULCER OF EXOPHTHALMIC GOITRE

Dr. Rogers presented a second case to show a rare and disastrous consequence or complication of the exophthalmos of Graves' disease. It is instructive in illustrating the treatment which, to succeed, must be prompt and

thorough. He first saw him on January 19, 1917. The man then had a rather low pulse rate (of 100-120) for the severe grade of this disease. The mentality was sluggish instead of excited, and there was a tendency to stupor. The goitre was small and firm, the blood pressure 110, and there had been a loss of thirty pounds in weight during the previous six weeks. The exophthalmos was extreme, and an ulcer had developed over the left pupil. This was accompanied by great œdema of the conjunctiva, which protruded through the palpebral fissure and forced the lids apart. The right eye was inflamed, and was somewhat insensitive to touch, but showed no ulceration. As he had found it possible to produce an appreciable enophthalmos by section of a filament of the sympathetic which crossed the inferior thyroid artery (provided the filament was found), he exposed on January 20, under local anæsthesia, this artery by a vertical incision along the lower part of the posterior border of the sternomastoid muscle. He tied and cut the artery, and sectioned all the filaments of tissue which lay in its neighborhood and resembled a sympathetic nerve fibre. The condition of the patient seemed so precarious that he had to finish the operation without attempting the same thing on the other side. The resultant effect was negative. He was placed upon a few drops of an extract of the whole adrenal gland every three hours, as he had found this sometimes beneficial. The right eye then began to show conjunctivitis, and on February 2, 1917, under local anæsthesia, he attempted to section, as on the other side, the lower cervical filament of the sympathetic and at the same tied the right inferior thyroid artery. The resultant enophthalmos was just appreciable, and by no means enough to prevent the development of a corneal ulcer. A day or two later the ulcer seemed worse, and the conjunctiva began to be œdematous. If this continues, and the lids cannot be closed, sloughing is almost certain to follow and destroy the eye. Consequently, on February 6, under ether, he made a curved incision concavity backward, along the anterior margin of the temporal and zygomatic fossæ and through this opening chiselled away the whole of the outer wall of the orbit behind its anterior margin. After incision of the orbital periosteum and fascia, the orbital fat protruded into the zygomatic fossa like a hernia cerebri out of the skull. It showed the tension which existed behind the eyeball. Even this lessening of the orbital contents did not permit a complete closure of the eyelids. After suturing the skin and fascia so as to close over the temporal fossa, he then sutured together the eyelids, and afterwards found this made so much pressure upon the eyeball that six hours later the sutures had to be removed. He next quickly exposed by a transverse incision, and ligated, the upper poles of both thyroid lobes. The next day the conjunctiva had become so œdematous that the lids were forced wide apart. An attempt was made to prevent sloughing of the cornea by the application of vaseline, but it seemed hopeless. On February 12, Dr. Knapp made another and more successful attempt to close the eyelids. Under ether he split, longitudinally, the apposed edges of the lids on the conjunctival side of the eyelashes. He then cut through both eyelids nearly to the conjunctiva,

along the upper and lower margins of the orbit. These liberating incisions then allowed the lids to be held in apposition with mattress sutures, which approximated the split raw edges of the eyelids. Union has taken place enough to protect the cornea and yet allow space to instill a wash to cleanse the ulcer.

At present it looks as though the upper half of the right pupil might be preserved for sight. This case teaches the necessity of prompt action. As soon as œdema of the conjunctiva appears, the outer wall of the orbit should be excised and in addition the eyelids should be freshened along the margins and sutured together. Tension must be prevented, and can be relieved by liberating incisions through the lids along the edges of the orbit.

Excision or section of the sympathetic has but slight, if any, effect in decreasing the exophthalmos. Suture of the lids has often been condemned, but it is an indispensable procedure when liberating incisions make it free from tension.

FACTORS BEARING ON THE MORTALITY IN OPERATION FOR BILIARY OBSTRUCTION BY CALCULUS

Dr. Frederick T. Van Beuren read a paper with the above title, for which see page 169.

He said that the paper had been written because all statistics need a certain amount of explanation. It is not a fair thing to take any set of statistics and compare them with any other set unless one knows the details of the operations from which the statistics were made, and when in Dr. Matthews' article the statistics of the Roosevelt Hospital were compared with the statistics from the Mayo Clinic and Dr. Erdmann's, it made it look as if the Roosevelt operations were very much more fatal than the others.

As a matter of fact, he could not by any means find that that was so; and, after finishing the investigations of their own cases, up to two years ago, he looked over the article by Dr. Mayo and found that they had followed out all the recommendations that he made to safeguard operation in this condition, with one exception; and that was that they did not examine the stools every day for bile until it was found that there was bile in the stools. He considers that a very desirable thing. Where cases have been watched outside for months and even for years—some of them twenty or thirty years, as some of these cases had been—it doesn't pay to watch them for very long in the hospital to see whether they have bile coming through with their stools or not; and as to bile in the ducts, one cannot tell until one operates whether there is bile in the ducts or not.

In analyzing Dr. Mayo's statistics, one finds in his cases that had jaundice the death rate was 10 per cent., and in those cases where complete obstruction was present, their death rate was 25 per cent. All cases reported in the present paper were of these two types. The total death rate, of 492 cases, was pulled down considerably by the fact that, in those cases where

there was no obstruction and where the calculi were discovered at operation in the common duct, the death rate was only 3 per cent.

In Dr. Erdmann's article there was nothing enlightening in this particular regard, and it is only fair to insist that the mortality depends largely on the condition of the case when it comes to the surgeon and the complications that occur. The complication they found occurring for the most part fatally was pneumonia—four out of nine cases had definite signs and two others had very suggestive signs of pneumonia. That is, six out of nine cases died with pneumonia, whether of the pneumonia or not. The pneumonia, of course, being a terminal type, was probably due to the fact that their condition was so reduced that they couldn't stand the extra amount of strain on their resistance that came inevitably with the operation.

Dr. Charles H. Peck said that the mortality depends largely upon the amount of obstruction present, the pre-operative complications and the general condition of the patient, aside from the ordinary operative accidents of any group of very ill cases. If one could select a series where the obstruction had been short in duration or where the stones were found accidentally at operation for an ordinary gall bladder condition and the patient was not depleted and had no pre-operative complications, the mortality should be very low. The average surgeon sees a good many cases of common duct stone operated upon without trouble and without mortality.

In the desperately ill cases that have had prolonged jaundice or prolonged sepsis in the form of cholangitis, the resistance is greatly lowered and some will, from one complication or another, not survive the operation. The cases that are the most difficult are the secondary operations. In addition to the ordinary difficulties one has the operative adhesions to deal with, involving often a difficult and prolonged approach to the common duct before one can begin to do the work upon it.

He had been unfortunate enough to have two such cases during this past season. One had, following cholecystectomy, biliary obstruction for over six months with persistent and increasing jaundice. The attempt to find the cause of the obstruction proved very difficult. The biliary duct was strictured, and following it up to the liver and the cicatricial tissue seemed to run into both radicals of the hepatic duct and he failed to find a dilated duct which could be drained above the cicatrized portion. The patient died five days after the operation, from oozing and hemorrhage, the result of the persistent jaundice.

Another unfavorable result he had had during this past season was in an obstructive case with a lesser degree of jaundice and persistent recurring pain, a patient who had had two operations in the preceding fifteen months, the exact nature of which he could not find out. At the third operation, which he performed, he found the gall bladder absent, a very dense mass of cicatricial tissue all about the duct, an extremely difficult approach, two moderate-sized stones impacted down in the region of the papilla, requiring a transduodenal choledochotomy, after which he was able to get a probe well up in the duct

and relieve the obstruction. This patient was sixty-eight years of age, a feeble old man much depleted by his former illness, but in spite of that Dr. Peck was rather hopeful that he might survive the ordeal, and he believed he would have done so except for an unusual complication. About three or four days after the operation there was a leak in the duodenum. The leakage was so profuse that he thought the suture in the duodenum had given way, and feeling that the consequences would certainly prove fatal, he made an attempt to close the fistula. It was not in the suture line; it was about half an inch back of it. He could see it distinctly, a round opening which would admit the tip of a lead pencil, and he attempted to close it, but on account of the inflammatory tissue was unable to get a very satisfactory closure, but a flap of tissue and pressure of the drainage tube secured a partial closure of the opening. The patient died from exhaustion following the two operations added to the leakage of the duodenal fistula.

He mentioned these cases as two that would be recorded fatalities from bile duct obstruction, but which could hardly be fairly included among a group of cases of primary operation for common duct stones, because both presented unusual difficulties which he was unable successfully to overcome.

It is an extremely important group of cases; in the routine, ordinary case the mortality should be low. Taking the cases as they come, with pre-operative complications and the debilitated, feeble, old patients that one meets with in the average hospital service, the operative mortality is bound to be fairly high if all cases are reported.

Dr. John Douglas said that it seemed to him that another element not mentioned by Dr. Van Beuren should be considered as affecting operative mortality, *viz.*, the kidney function at the time of operation. Within the last year he had lost two cases of stone in the common duct, one in a woman sixty-eight years old and another in an older woman, and in neither case was the operation a particularly long one or particularly difficult technically. In both cases the urine was diminished the day following the operation with complete suppression within forty-eight hours.

This is a factor in the operative mortality in these cases, whether due to the anæsthetic alone, or that the anæsthetic adds sufficient irritation to the already damaged kidneys to cause a complete suppression, and must be considered in giving a prognosis.

Dr. Joseph Wiener said that a number of years ago he looked up the mortality after operations on the biliary tract done by different surgeons in one hospital. He had gotten the idea in his mind that the time occupied in operation had a good deal to do with the mortality. A number of years before that he saw Dr. Hans Kehr operate on three cases in this city; each operation took an hour and half and all three patients died. All three patients had normal pulse and temperature before the operation, none was severely ill, all should have given a good prognosis.

As he had watched cases done by different surgeons he had noticed that the patients who were on the operating table over three-quarters of an hour

were those that not necessarily had increased mortality but increased morbidity. He then looked up a large number of cases and was struck by the fact that certain cases died pretty regularly, *i.e.*, those that were on the table more than an hour and a quarter.

Since then he had always considered the time occupied in operation a fact of a great deal of moment. Of course the time of operation means the time of anæsthesia. When one looks up the cause of death in these cases one finds nephritis, pleurisy, pneumonia—all three of those complications are at least in large measures due to anæsthesia. If one could do these operations under local anæsthesia one would see little acute nephritis, practically no pneumonia, and very little pleurisy.

The handling of the gut required in these cases also plays an important part, and the incision of Sprengel may give maybe not less mortality but certainly less morbidity.

About a year ago he had under his care a gentleman with biliary obstruction who was a very bad risk on account of the condition of his heart, arteries and kidneys, and he decided to do part of the operation under local anæsthesia, with the Sprengel incision. That incision, if made carefully, takes almost fifteen minutes. As soon as the abdomen was open the man received gas and oxygen for about fifteen minutes while the gall bladder was being removed, and then it was stopped and the abdominal wall sutured. He made an uneventful recovery.

If such a course could be followed in more cases he thought there would be less trouble after operation. As to the coagulability of the blood, in jaundice cases he had made it a rule for years not to operate until the time of coagulation was determined, and if the coagulation was over seven minutes to give the patients a preliminary treatment of one of the calcium salts. He had found the calcium lactate and calcium chloride very useful. The calcium chloride is used in large doses but the calcium lactate should be given in small doses, from five to ten grains. In that way he had been able in forty-eight hours to reduce the time of coagulation from ten or eleven minutes to five or seven minutes. In several cases he had injected blood serum before operations. He had used ordinary antitoxin, which is, of course, made with horse serum.

In postoperative hemorrhage there is a drug, or rather a patent preparation, known as coagulose, which he had found extremely valuable. He had used it in four or five post-operative hemorrhage cases, not all biliary cases, and in every one the bleeding had stopped. In one case he used a preliminary blood transfusion and the patient's general condition improved and she recovered from the operation. He thought the blood transfusion had something to do with it.

He had had two unfortunate experiences in duodenal leakage similar to Dr. Peck's. Both patients died. In both cases the leakage was at the suture line, and both patients died of starvation.

Dr. Elsworth Eliot, Jr., remarked, in regard to the mortality of opera-

tions for cholelithiasis, that much depends upon the condition of the circulation and kidneys. Much also depends upon the degree and length of obstruction, and in these cases in which obstruction has existed for some time, a considerable mortality is due to an ascending infectious cholangitis terminating in small, if not actually microscopic, diffuse abscesses in the liver parenchyma.

Dr. Charles N. Dowd said that the consideration of this series of cases brings up various topics which are important in New York surgical work, for a large proportion of cases seen in metropolitan hospitals are extremely bad risks. Their internal organs are diseased, they are old, they have all sorts of complications, and are mentally and physically exhausted.

One may follow one of two courses—either try to give them the possible benefit which surgery offers, or simply refuse to accept them as surgical risks and let them go to their fate, whatever that may be.

Most surgeons feel that these people have a just claim for help and that too much regard to our operative statistics in trying to relieve them should not be entertained. The subject was brought strongly to his mind early in the winter when he operated for a small cancer at the margin of the second breast. The first breast had been removed for cancer three years earlier. The patient made an excellent recovery, and, as she was starting homeward, her husband stated that operation had been refused to her at a very good surgical clinic; yet operation has promoted her comfort and will probably prolong her life. She had a certain claim on surgery, and those institutions or surgeons who are so situated as to meet these undesirable surgical risks will, of course, have poorer statistics than those who have better selected clienteles.

There is, however, an advantage in having statements of the results as they are obtained under these disadvantageous circumstances, and there is a decided advantage in having the statistics of all the operators of hospitals published as a unit instead of having statistics from individual operators on selected groups of cases. Dr. Van Beuren's group represents the work of six different operators who accepted risks which they knew were grave. By the publication of both varieties of cases the matter is put in a fairer way before the profession, and men are less likely to be misled in prognosis.

Another element may be noted about this particular group of cases. In the entire nine cases, only one autopsy was obtained. This is due to laws which have now been on the statute books long enough for the profession to know their ill effects, and it is time that some concerted efforts should be made to change them.

Stated Meeting held March 14, 1917.

The President, Dr. Charles N. Dowd, in the Chair

PARTIAL RESECTION OF STOMACH AND ADHERENT INVOLVED PORTION OF LIVER FOR CARCINOMA

Dr. John Douglas presented a man, age forty-four, who was admitted to St. Luke's Hospital August 16, 1916. He had suffered from indigestion for three or four months previous to admission. Occasion-

ally vomited, and when vomiting occurred, which was only three or four times in the past three months, it was about two hours after eating, contained food eaten, was sour, and contained no blood or coffee-ground material. No blood per rectum. No tarry stools. Patient never had any pain in the stomach and is quite certain he had no gastric symptoms previous to present illness. Had lost eighteen pounds in weight. Physical examination revealed an easily palpable hard mass in the epigastrium, and radiographic examination showed a filling defect in the lesser curvature near the pylorus with a twenty-four hour gastric residue.

At operation a carcinoma of the lesser curvature near the pylorus was found. It was adhered to the pancreas posteriorly and to the left lobe of the liver anteriorly. A resection of the stomach by the Billroth No. 2 method was performed together with the removal of a wedge-shaped portion of the liver which was left adherent to the tumor.

Patient left the hospital three weeks later, after an uneventful recovery—and at present feels as strong as ever and has gained twenty-seven pounds and can eat anything.

The points of interest in this case were the short history of only three or four months before a tumor was easily palpable and the removal of the portion of the liver which microscopical examination showed to be involved by carcinoma cells by direct extension from the growth in the stomach.

The examination of the specimen of the stomach removed also showed the presence of an adenomatous polyp on the stomach mucosa 3 or 4 cm. from the edge of the carcinoma.

RESECTION OF PELVIC COLON FOR CARCINOMA

DR. DOUGLAS presented also a man, aged seventy-one years, who was admitted to the medical ward of St. Luke's Hospital August 26, 1916. He had complained of recurrent attacks of alternating constipation and diarrhœa for three years, during which time he had lost thirty-five pounds in weight. He also suffered from prolapse of the rectum, which caused bleeding, pain, and tenesmus. Had noticed a pulsation in the abdomen just above and to the left of the umbilicus since 1910.

Radiographic examination showed a retention of a large portion of the bismuth meal in the colon for seven days, even after enemata had been given to remove it.

Operation revealed an annular carcinoma of the fore portion of the rectum about 2 inches above the peritoneal reflection of the bladder, with an enlarged gland in the mesorectum. The intestine was resected over a distance of 2 inches below and 4 inches above the tumor, and an end-to-end anastomosis done over a large tube which was sutured to the upper segment. Patient made an uneventful recovery, with no fecal fistula or leakage at the anastomosis developing, and incidentally is cured of his prolapse. Pathological examination showed adenocarcinoma.

SUBACROMIAL BURSITIS

DR. DOUGLAS presented a man, aged thirty-nine years, who was admitted to St. Luke's Hospital medical wards June 29, 1916. He complained of pain in the left shoulder, which had been present for two years, during which time it had been treated by massage and local and medicinal treatment, with little relief. During the past three years he has been receiving vigorous antispecific treatment with injections of salvarsan and mercury.

A few days before admission he had received an intravenous injection of salvarsan in the left arm, after which the left shoulder became so painful that he could not sleep or rest. Abduction, rotation, and all motions of the shoulder were extremely painful. X-ray examination demonstrated a large shadow under the left acromion.

He was treated by the abduction method for six days without improvement, whereupon operation was performed.

The operation revealed a large, distended, thickened subacromion bursa containing about half an ounce of turbid fluid in which was floating a considerable amount of soft calcareous granular material. In the insertion of the supraspinatus tendon was the characteristic cheesy matter found in these cases. The bursa was dissected out and the cheesy material from the tendon insertion removed with a curette. The radiograph taken five months after operation shows that a small area of softened bone was removed at the same time.

At the present time, and since the operation, he is without pain, and motion in the shoulder joint is unrestricted.

This patient is shown because at a meeting of the Surgical Society one month ago one of the members stated that "subacromial bursitis" is a misnomer, and another that "it was not subdeltoid and not bursitis," and while he agreed that the lesion is probably primary in the supraspinatus tendon, this patient certainly had a distinct bursitis in addition.

DR. ALEXIS V. MOSCHCOWITZ said that it appeared to him that Dr. Douglas presented this case with the intention to show the error of Dr. Moschcowitz's statement at the previous meeting, namely, that, as a rule, cases presented as subdeltoid bursitis are neither subdeltoid nor bursitis. Judging by Dr. Douglas's presentation of this case, Dr. Moschcowitz is still inclined to maintain the correctness of his previous statement. As is well known, there are several bursæ in the neighborhood of the shoulder joint. One of these is called the subdeltoid bursa; another one is called the subacromial bursa; it is the latter which is erroneously supposed to be involved in the malady under discussion. As a matter of fact, it is not at all involved, or merely secondarily by its close proximity to the underlying tendon of the supraspinatus muscle, the calcareous degeneration of which is at the real bottom of the trouble.

DR. DOUGLAS rejoined that there was, as he had said in the presen-

tation of the patient, a bursitis. There was a lesion in the supraspinatus tendon which was probably primary. But the enlarged, thickened bursa was under the deltoid and also under the acromial process. Therefore, he felt that it was subdeltoid and also subacromial and also bursitis.

POLYPOSIS COLONI

Dr. Robert Erdmann presented a boy, who, when seventeen years old, was first operated upon for repeated hemorrhages from the colon. This began with diarrhœa and painful contractions, with blood in the stools and nausea at the age of ten. Bowel movements ten to fifteen per day. At the time of his first operation his weight was about 75 pounds. In September, 1915, hæmoglobin was 38 per cent. preceding a transfusion which raised it to 75 per cent., but in November preceding the operation it had fallen to 45 per cent. In November, 1915, an appendicostomy was done. In January, 1916, the hæmoglobin was 40 per cent. preceding his first operation, which was an ileostomy following, but somewhat modified, the method of Dr. John Young Brown, of St. Louis, described in the *Journal of Surgery, Gynecology and Obstetrics*, 1912. The entire colon was excluded absolutely by turning in the distal end of the ileum and implanting the proximal end of the ileum in the suprapubic region. Irrigation of the colon through the former appendicostomy wound was continued for a period of six months with no sign of improvement. Repeated examinations with the proctoscope revealed ulcerative areas and numerous small polyps.

In June, 1916, a colectomy with an ileosigmoidostomy was done; the entire cæcum, ascending colon, transverse and a portion of the descending colon were removed. At this time his weight was 69 pounds. March 2, 1917, his weight is 116 pounds, a gain of 47 pounds.

The excised colon was studded with sessile and pedunculated polyps, with here and there ulcerative areas.

Dr. Erdmann had seen this same condition five times recently, the patients all being under the age twenty-two. He also commented upon the little irritation of the skin in the majority of these ileostomy cases, also upon the extent to which these polyps involve the colon. In the majority of these cases the entire sigmoid and colon are involved, so that implantation is impossible or impracticable.

Dr. Lucius W. Hotchkiss, in this connection, reported a case of a young woman of twenty-one, where the polypoid growth extended to and protruded from the anus, and had been removed several times, and the case when it came into the hospital was so very ill, so far gone with this thing, that nothing could be done. She had a small perforation through the gut on the left side and an abscess formed in the abdominal

wall. This was opened, and she got well of that, but died as the result of the extensive growth, which had probably become cancerous.

This case had evidences of involvement of the entire lower bowel, and the anal portion of the growth had been operated upon several times.

Dr. Charles N. Dowd said we ought to qualify the statement that "skin destruction is not caused by the intestinal discharge when an artificial opening is made in the terminal ileum." In at least one case he had seen very extensive destruction of the outer layers of the skin from such discharge, so that there was a raw, granulating surface for several inches about the stoma.

CARCINOMA INVOLVING GLANS PENIS

Dr. Erdmann presented a man who at the time of his operation for cancer of the penis was sixty-one years old—operation August 17, 1911. There was involvement of the inguinal glands and in addition a practically impassable stricture of the urethra. Filiform dilatation to No. 14 French and then amputation of the penis in the middle and proximal third, with excision of the glands in both inguinal regions, followed by infection in the inguinal wound which lasted fully three weeks. Perfect repair and recovery with no recurrence.

COLLOID CARCINOMA OF THE TRANSVERSE COLON

Dr. Erdmann presented a man who, when operated upon ten years ago, was forty-three years of age. Thought to be suffering from appendicitis, for which he was operated upon. Three days later apparently suffered from intestinal obstruction. Upon opening the abdomen, it was found that he was suffering from carcinomatous growth in the transverse colon. A cæcosigmoidostomy was done, owing to the grave condition of the patient at the time, and three months later the involved portion of the colon was removed. The transverse colon to the splenic flexure and a portion of the ascending colon were taken away. This patient now has gained over 60 pounds in weight, with no evidence whatever of recurrence.

Dr. Robert T. Morris, commenting upon the case of amputation of the penis, said that nearly three years ago, after amputation of the penis for carcinoma, in one of his patients, there was recurrence in both inguinal regions. He removed the glands and then shortly afterwards there was such diffuse infiltration that he gave the case up as hopeless. Dr. Hirsch thought that it would be worth while to use the X-ray, which was done, and this man now is apparently perfectly well. Not that he is out of danger, but so far as can now be judged he is well. That is a case in which, after recurrence was apparently hopeless, the X-ray has apparently caused the disappearance of all of the carcinoma.

HERNIA STRANGULATED BY A CONGENITAL RING LOCATED WITHIN THE CONFINES OF THE SCROTUM

Dr. Alexis V. Moschcowitz presented a man, thirty-seven years of age, who was seen by him January 6, 1916, when the following history was obtained:

Patient knows of the existence of a hernial protrusion in his left inguinal region for the past ten (10) years. With the exception of one occasion, about five (5) years ago, when it was acutely strangulated, and which was reduced by taxis, the hernia was always reducible. Three (3) days before consulting Dr. Moschcowitz the hernia suddenly grew larger and could not be reduced; but as the patient had no pain, nor nausea, nor vomiting, he did not worry about the hernia, and did nothing further beyond trying to replace the contents. He tried again to do so on the following morning, but was again unsuccessful. During all this time he wore his truss over the unreduced hernial contents. Subsequently further unsuccessful attempts to reduce the hernia were made by his trussmaker and also by several physicians.

When he presented himself to Dr. Moschcowitz for examination there was found a strangulated inguinal hernia, about the size of a large orange, which filled the left half of the scrotum. Owing to the mildness of the symptoms, it was presumed that omentum only was strangulated. Patient was urged to enter the hospital at once for operation, but for business reasons, and because he doubted the gravity of his condition, he did not enter the hospital until the following day.

Patient was operated upon directly after his admission to the hospital. At the operation it was found that after completely splitting the aponeurosis of the external oblique, as is customary, beyond the external inguinal ring, and after opening the sac, it was still impossible to reduce the omentum, which formed the sole content of the hernia. Before this could be accomplished it was necessary to split the sac further downward into the scrotum. About two (2) inches distally to the external inguinal ring there was encountered a very firm ring protruding into the sac and completely surrounding the latter. After dividing this ring there was no further trouble in lifting the omentum out of the scrotum; there was a very distinct constriction furrow to be seen upon the omentum; the distal part was of a deep purplish black color and necessitated resection; the proximal part was normal. After an uneventful convalescence, patient was discharged January 20.

Dr. Moschcowitz also stated that he had seen such rings within hernial sacs very frequently. This is, however, only the third time that he has seen such a ring to be the cause of a strangulation. Two of the cases were described by him in the Medical Record for April 20, 1901. The occurrence of such rings is very interesting from an embryological viewpoint; this matter was discussed in detail in the article above mentioned.

ENCYSTED HERNIA OF COOPER

DR. MOSCHCOWITZ presented a man, twenty-eight years of age, who had had a right inguinal hernia for six years; apparently it was strangulated on two occasions, but was relieved without operation. He entered hospital for a radical cure, and was operated upon by Dr. Saltstein, the house surgeon, in the presence of Dr. Moschcowitz January 26. Nothing abnormal was diagnosticated before the operation. At the operation a large sac containing a small amount of clear fluid was entered on the inner side of the spermatic cord; the testis was in the bottom of the sac; it was immediately seen also that the sac did not communicate with the peritoneal cavity. The general appearance of the parts, namely, a slight thickening at the upper part of the sac, led immediately to the diagnosis of an encysted hernia. Search was now made for the true hernial sac above the lower one, and then the operation was finished by the Andrews method.

The great characteristic of these herniæ, and what differentiates them from herniæ complicated by ordinary large hydroceles, is the dense adhesion where the two sacs join; in fact, it is utterly impossible to separate them with the ordinary methods of dissection. It certainly was so in the present instance, and in two other cases previously operated by the writer.

An encysted hernia of Cooper is that form of congenital malformation in which the processus vaginalis peritonei accompanying the descent of the testis becomes shut off only at the upper or abdominal end, the tunica vaginalis does not form, nor does the reminiscence of the processus vaginalis become obliterated.

STRANGULATED HERNIA "EN W"

DR. MOSCHCOWITZ presented a man, fifty-five years of age, who was admitted to his service at Mt. Sinai Hospital November 16, 1916, when following history was obtained. He had had a very large scrotal hernia for twenty years, which had always been reducible, and which he attempted to retain with a truss, however, unsuccessfully. About six hours before admission, after a hasty movement, he found that his hernia suddenly became painful and that he was unable to reduce it in spite of numerous attempts. He did not vomit, although there was considerable nausea. His bowels moved once with the aid of an enema.

Patient was in collapse when seen by Dr. Moschcowitz, shortly after his admission; his pulse was very poor and very rapid; face and extremities deeply cyanosed. On examination there was found a strangulated right inguinal hernia, about the size of a cocoanut. In addition, however, there was found a most interesting condition, namely, within the confines of the right iliac fossa and extending slightly into the pelvis, a very distinct sausage-shaped mass, about six inches long and three inches wide, which was tympanitic on percussion and was just as tender as

the hernia. The mass should have been diagnosticated correctly; unfortunately, it was not, as Dr. Moschcowitz looked upon the entire mass as a strangulated bilocular properitoneal hernia. The error in diagnosis was proven only at the operation.

Immediate Operation.—On opening the sac there were found within it two loops of small intestine, each about the size and shape of a ring sausage, of a deep purplish, almost black, color, which apparently had no connection with one another within the hernial sac. When the strangulation was relieved, pulling upon the loops brought down only normal intestine, with distinct strangulation furrows. A finger introduced into the abdomen now felt another loop of intestine, which, on account of its size, could not be brought out of the abdomen. The hernial ring had to be split wide open before this could be accomplished. It was then seen that it was a loop of intestine fully 6 inches in length and about 3 inches in width, of an absolutely black color, and very much infiltrated; it was evidently strangulated much more seriously than the scrotal loops, because whereas these recovered their circulation completely within ten minutes upon the application of warm saline, the abdominal loop did not recover for a full half hour. The loop was then returned, and the operation was finished by the Andrews method. Slight infection of the wound followed, but patient was discharged sixteen days later. Much to Dr. Moschcowitz's surprise, the patient has a small recurrence at the lower angle.

This case is typical of that form of strangulation which has received the name of "hernie en W." Dr. Moschcowitz believes that in this instance it was brought about by partially successful attempts at taxis, which reduced the smaller connecting loop into the abdomen and left 2 loops in the scrotum. The difference in the appearance of the 3 loops was particularly well marked and can be accounted for by the fact that the loop was strangulated not only by the hernial ring, but also that its mesentery was bent upon itself very sharply at an acute angle.

TRUE PERINEAL HERNIA

Dr. Moschcowitz presented a girl two and a half years of age. Six or seven weeks before, the mother noticed quite accidentally a swelling in the right buttock; this swelling increased greatly in size during the following four weeks, but apparently it caused no discomfort to the patient.

The general physical examination was negative except for the following: There was a moderately firm, very movable swelling in the right buttock, occupying, roughly speaking, the region bounded mesially by the coccyx and anus and laterally by the tuber ischii and gluteus maximus. The palpable surface of the mass was globular, and increased in size when the child cried. On manipulation this mass escaped in an upward direction, but it never disappeared entirely. The tumor caused

a notable fullness in the buttock; unfortunately, however, the photographs made did not turn out sufficiently well for reproduction. On palpation per rectum there is to be felt a mass upon its right; when an attempt was made to reduce the mass the finger in the rectum felt that the fullness increasd. It was impossible to determine by examination whether the hernia (for such it was taken to be) was reduced through the sciatic notch or through a hiatus in the levator ani.

Dr. Moschcowitz was somewhat at a loss to account for the fact that the hernia could not be reduced completely no matter what the manipulations, or how frequently attempted. Finally the conclusion was arrived at that there existed a properitoneal lipoma in connection with the hernia, or that the contents were adherent to the fundus of the sac. As will be seen, the former diagnosis proved to be correct.

Two methods of procedure were considered, namely, either by the abdominal or by the perineal route. On account of the large subperitoneal lipoma, the final decision was made in favor of the former. The operation was performed May 23, and the procedure was as follows:

With the patient in the prone position, and with the buttock elevated, an oblique incision about 3 inches in length was carried over the tumor in the right buttock. On reaching the ischiorectal fossa there was encountered a long lipomatous mass, distinctly encapsulated, leading upwards and into the depth. At its basal attachment, where it was distinctly more adherent, it had to be separated from the underlying peritoneum by sharp dissection. When this was accomplished there was found a defect in the pelvic floor, through which 2 fingers could be introduced into the abdomen as high as the pelvic brim; the finger entered through the posterior part of the levator ani, approximately just anterior to the coccygeus; on increasing the intra-abdominal pressure a hernial sac was seen to descend through this hiatus; this sac, however, was not opened nor resected, as it was seen to be too intimately adherent posteriorly to the rectum, and anteriorly to the vagina (hernia par glissement). The opening in the depth of the pelvic floor was then closed by interrupted chromicized catgut sutures, and was then reinforced by liberating the gluteus maximus and suturing its inferior margin to the deep pelvic fascia.

The specimen removed proved to be a lipomatous mass 6 inches long and 2 inches wide. A small portion of peritoneal sac was adherent at its deepest attachment, and was proven to be such on microscopic examination.

After primary union of the wound, patient was discharged June 9, 1916.

From as much information as could be gained from the operation, it appeared to Dr. Moschcowitz that the hernia made its exit at the seat of predilection for these herniæ, namely, at the posterior border of the levator ani, or, better said, through the very frequent cleft between

the levator ani and coccygeus; and that subsequently the hernia burrowed a way for itself into the ischiorectal fossa. In this respect it corresponds to the picture of the few other cases of classical perineal hernia reported. The lipoma which accompanied the hernia is not at all an infrequent occurrence.

Dr. George D. Stewart had been disposed to consider that strangulation, or constriction which may result in strangulation, may occur at the inner ring, through the canal, at the outer ring or anywhere beyond that in the sac. Frequently a sac almost closes at the ring, and then another portion of the peritoneum is pushed down and the first constriction depressed beyond the level of the external ring remains as a constriction in the sac. This process may be repeated several times, so that often, particularly in the congenital hernia, one may find the remains of several rings in a hernial sac. He recalled distinctly having seen strangulations occur in one of these old narrowings, so that Dr. Moschcowitz's location of the possible strangulation is not, he thought, correct.

Dr. Moschcowitz said that the constriction described was outside of, but still part of, the sac. In other words, after the sac was peeled away there was a constricting ring composed of a mass of fibrous tissue, which elevated the serosa all around.

THE SPRENGEL TRANSVERSE ABDOMINAL INCISION

Dr. Arthur S. Vosburgh presented two patients illustrating the use of the Sprengel incision. He said that his interest in this particular incision arose from two unfortunate results which came under his immediate observation recently. Previous to seeing the failures in these two cases, his acquaintance with and knowledge of the incision was purely academic.

The first patient was a strong, vigorous man, upon whom he had done an exploratory celiotomy for suspected gastric ulcer, using a right rectus vertical incision. The patient took ether very badly, straining and vomiting during the entire time of anæsthesia. His convalescence was stormy, marked by the inability to take fluids or hold anything on his stomach. This occurred without temperature or increase in pulse rate. He had no movement of the bowels, and began to look pinched. On the fourth day it was evident that the man was suffering from an ileus undoubtedly mechanical in its nature. The patient was taken to the operating room, and, with Dr. Darrach's assistance, the abdomen was reopened through the old incision. On dividing the suture line, a loop of intestine 15 cm. in length lay in the long axis of the wound between the fibres of the rectus muscle. This was dark, had lost some of its lustre, and was coated here and there with flakes and fibrin. This was freed, washed off with hot solution, placed in hot saline packs, and, as circulation was not impaired and color returned to the loop, it was

dropped back into the abdomen. An investigation of the deeper portion of the wound revealed the fact that the peritoneum, together with the posterior aponeurosis of the transversalis (which in this portion of the abdomen are intimately adherent), had retracted to a distance of from 2 to 3 cm. on either side of the line of the incision. This man died.

Another case presenting a similar condition had a more fortunate outcome. This second case had sustained a stab wound of the abdomen, dividing the deep epigastric artery. His abdomen had been explored through a separate incision and the bleeding points secured. No further lesion having been found, the patient's wounds were closed in the usual manner. The incision was a vertical one through the right rectus extending 4 cm. above the umbilicus to 8 or 10 below the umbilicus. A day or two following his operation the patient called the attention of his doctor to his wound, saying it felt "wet," and he thought something "had given way." When the dressings were removed it was discovered that the patient had torn asunder the suture line and partially eviscerated himself. A loop of small intestine lying in the long axis of the wound was very much in the same position as in the case previously described. Here the result was more fortunate. After washing the loop of intestine it was pushed back and the wound was drawn together with adhesive straps. The patient made a slow recovery, the wound healing by granulation.

Consideration and study of these two cases convinced him that any operation upon the upper abdomen, where, because of distention, or by reason of conditions which would throw the transversalis muscle of the abdomen into active contraction, calls for the selection of incisions other than the vertical ones.

Dr. Vosburgh here presented his first case in which he had used the Sprengel incision.

A man had sustained a stab wound, self-inflicted, of the left upper quadrant. The wound was made with a butcher's knife an inch in width and 6 or 8 inches in length. The direction of the blade had apparently been backward and downward. The knife had divided the seventh costal cartilage on the left side, entering the anterior extremity of the costophrenic sinus. The situation of the wound and the symptoms of rigidity in the left upper abdomen called for immediate celiotomy. There was no enlargement of the precordial area of dullness, no sign of hæmothorax or pneumothorax. The abdomen was opened by a transverse incision placed about 5 to 7 cm. above the level of the umbilicus, extending from the median line across the rectus well into the oblique muscles on the left side of the abdomen. This incision gave an excellent exposure of the upper abdomen. The control of the rectus was accomplished by placing 2 or 3 catgut sutures (passed on a curved needle by the sense of touch through the substance of the rectus above and below the intended line of incision). The exploration of the abdo-

men disclosed a wound on the anterior surface of the stomach, 3 cm. below the lesser curvature, a little to the left of its mid point, a punctured wound through the left lobe of the liver, and an opening in the diaphragm a little to the left of the central tendon. The incision gave ample room for the closure of the wound in the stomach and for the suture of the diaphragm. The wound through the liver had ceased to bleed, and this was left alone.

It will be seen from the description that the intra-abdominal work was carried on in a region ordinarily difficult of approach, yet so good was the exposure obtained by the incision that the work was accomplished with the greatest ease. This patient had an uninterrupted convalescence except from a chromic gut abscess discovered on the eighth or ninth day. This was in the left extremity of the wound, not over the region of the divided rectus.

The second patient on whom he used this incision gave a history of chronic appendicitis, the symptoms being ascribed to the presence of adhesions about this portion of the intestines, *i.e.*, cramp-like pains, referred to the middle region of the abdomen. A transverse incision was made dividing the right rectus, extending from the midline into the oblique muscles on the right side above the level of the semilunar fold of Douglas. A fan-shaped adhesion bound down the distal third of the appendix, the spread-out portion of the fan being attached to the right iliac fossa. This adhesion, together with the mesentery of the appendix, so included the terminal ileum that inversion was inadvisable.

He presented these two cases to illustrate the value of the Sprengel incision. Although his experience in its use had been so limited, the mechanics of the incision appealed to him very forcibly. The physiological action of the abdominal muscles has been so ably presented by Dr. Moschcowitz that he did not think it necessary to discuss it. The incision is, of course, applicable to those portions of the abdomen where the peritoneum is intimately adherent to the transversalis muscle or its aponeurosis. Thus, in the lower abdomen, where the aponeurosis of the transversalis passes anterior to the sheath of the rectus, it has no advantage over other incisions, but where the aponeurosis of the transversalis muscle passes posterior to the sheath of the rectus it has its greatest value. The direction of the pull of the combined forces of the oblique muscles of the abdomen is transverse in direction. Dr. Moschcowitz has well pointed out that the aponeuroses of insertion should be considered as minute tendons running transversely to their insertion in the linea alba. Therefore, sutures used to unite a vertical incision lie between the strands of these small tendons, and when the transversalis is thrown into action these sutures tend to pull out with greatest ease. For example, if an attempt was made to unite two whisk brooms end to end by interrupted sutures passed between the individual strands

from one broom to the other, the futility of the effort to so unite the brooms would be apparent.

The objections to the incision may be grouped under the following heads:

1. Time in getting into the abdomen. In his cases it was but little longer than it takes to make an ordinary vertical incision.

2. Division of the rectus. A study of the nerve supply of these muscles shows that they are less liable to be injured in this incision than in a vertical incision.

3. Closure of the abdomen is much more rapid in a Sprengel incision than it is in a vertical incision, where the patient is strangling and straining under a difficult anæsthesia or because of irritating causes of operative procedure.

4. Drainage can be introduced as well in this as in the vertical incision, selecting that portion of the incision not traversed by the rectus muscle.

Dr. Vosburgh presented a third case, a man thirty-five years of age, who was admitted to Bellevue Hospital January 9, 1917. As the patient spoke no English, a complete history could not at first be obtained. The patient was in shock, with pain and rigidity of the right upper abdomen, a weak rapid pulse, a high blood count, the history of vomiting, and the extreme agony which the patient was enduring demanded an immediate celiotomy. The abdomen was opened by a vertical incision through the upper part of the right rectus muscle. The abdomen was full of bile-stained fluid. The injection of the peritoneum was more marked as the pyloric region was approached. A perforation was discovered in the centre of an indurated area, situated in the anterior wall of the first portion of the duodenum. The perforation was closed by two sutures of plain catgut placed as purse-strings about the opening. As the walls of the intestines were so indurated as not to allow perfect tying of the purse-string sutures, it was deemed best to drain. A rubber dam drain was placed in the middle of the incision and withdrawn the following day. His convalescence was unmarked by pain, vomiting, or rise in temperature. A profuse discharge continued from the site of the drain for upwards of a week. This led to the belief that the occlusion of the perforation in the bowel had not been perfect.

The peculiar fact (elicited from the patient's brother, acting as interpreter) was the absence of pain at any stage of gastric digestion. The ulcer must have been of long standing, at least of sufficient length to account for the marked induration found in the wall of the gut.

Dr. Clarence McWilliams said that eight or ten years ago he saw Roux, in Laussanne, Switzerland, make this transverse incision, and he did it as though it were an every-day occurrence to him, and he said that he used it in all his upper gastric cases exactly as it is done to-day.

Personally, in the long run, Dr. McWilliams did not believe that this

transverse incision will prove to have greater advantages than the vertical one. There will be just as many herniæ following it as with the vertical incision. The repair of such a hernia will be more difficult than that following a vertical incision. If one makes the vertical incison long enough one can get almost as good an exposure with it as with the transverse incision.

Dr. N. W. Green said that Dr. Abbe presented a young woman before this Society in April, 1912, who was at that time about twenty-two years old, and upon whom he had operated when an infant. He had used a transverse incision just about the level of the umbilicus for the removal of a kidney tumor. He augmented this incision by an additional median line incision, and he spoke at that time of the facility with which he was enabled to take it out. He said the tumor weighed a third of the weight of the child before operation, or when removed the child weighed 15 pounds and the tumor 7½ pounds. That was twenty years before he presented the case, and it would be now about twenty-five years ago.

He had been interested in this incision, and he thought that in certain cases, if one makes the selection of the case, it is far superior to the longitudinal rectus incision. But there is a certain type of cases where one cannot get as much access to the dome of the abdomen as by the longitudinal rectus incision, if one will bring the upper part of the incision toward the median line, especially in those patients that are very thick through the chest and are inclined to barrel-shaped chests. In these the cross incision does not give as much access to the gall-bladder region as does the longitudinal rectus incision.

He was fortunate enough to have a couple of acute gall bladder cases on the same night a little while ago, and in one he used the transverse incision and in the other he used the regular right rectus incision in order that he might see which one gave the easiest access. He thought the regular right rectus incision gave him a little easier access than the transverse incision in that particular case, but the transverse incision was far easier to sew up.

Dr. Eugene D. Stewart said that many had used the transverse incision accidentally or incidentally, but to deliberately place the transverse as the operating incision, not as an addition, has not been done for a long time or consistently. Moschcowitz taught the deliberate placing of the transverse incision and he proposed to call it by his name. He employed it at his clinic last Saturday. The first case was diagnosed gall-stones most definitely by the X-ray. The case turned out to be a tumor of the suprarenal body. Having started with a vertical incision, he added a transverse one, and succeeded in making a very comfortable exposure.

In the next case the X-ray said most decidedly that there were no gall-stones and no pathological condition of the gall bladder. Patient

had been operated on seven months before at another hospital, a number of stones had been taken out, a cholecystostomy performed, and the biliary fistula had persisted, closing only a few days before his operation. The opening of the fistula was some distance below the ribs. The edge of the liver could be felt practically two to two and one-half inches above that level. He employed a Moschcowitz-Sprengel incision, exposed the edge of the liver, then, working downwards, removed the adhesions and got a satisfactory exposure for removal of the gall bladder. Incidentally, the X-ray notwithstanding, the gall bladder was pathological and there was a gall-stone.

He had used this incision on a good many other occasions. It has many advantages, but one cannot say that it is universally applicable. In the lower abdomen it is rarely of service and not always to be employed in the upper by any means. He was guided in its employment by the exposure he was seeking. If he wanted to see a good deal of the abdomen transversely he used the transverse incision; if it is the vertical exposure he was seeking, he used the vertical. A vertical exposure is much more frequently to be employed than the transverse.

Dr. William Darrach reported one transverse incision that he did last August for a man that came in with a large hernia following a kidney incision in the loin and also symptoms of incomplete obstruction.

They cured his lumbar hernia and did a transverse incision and found a chronic gall gladder, an angulated transverse colon. They took out the gall bladder and freed these incisions through a Sprengel incision. This resulted in moving his hernia over from the left to the middle line. He has a hernia now allowing a distinct bulge in the region of the right rectus, although the anchoring sutures of chromic gut were used and they thought they did a careful suture afterwards.

One other interesting point about the man was that in closing his hernia in the loin some twenty-day chromic gut was used, which gave him a severe neuralgia of the ileohypogastric, which lasted for forty-one days and then stopped rather abruptly.

Dr. Alexis V. Moschcowitz said that in a measure he is discussing the transverse incision, so to say, *in loco parentis*, and therefore he hates to disagree with some of the beautiful things that have been said about the incision. He had found the incision to work beautifully for 135 cases, but the 136th case developed a hernia, which was about as bad a hernia to close as any one in his experience. The next four cases were again perfectly normal, but the following case ruptured his wound open on the sixth day; he was resutured, and again ruptured his wound open after another seven days. This wound has healed by granulation, and Dr. Moschcowitz has no doubt it will also be followed by a hernia.

Accidents of a similar nature are more frequent after longitudinal incisions. In spite of these two accidents, Dr. Moschcowitz still be-

lieves that the incision is anatomically correct, and he will continue to use it.

POST-OPERATIVE BURSTING OF SUTURED ABDOMINAL WOUNDS

Dr. William Darrach said that the question of bursting out of the deep line of sutures is one that had interested the surgeons at Bellevue recently rather seriously. He would like to find out how frequently such an accident does happen. It hadn't happened to him until a little over a year ago, and since then he had had two cases, and there had been two others on the First Division, where the deep layers had given way and there had been a prolapse of intestine with no separation of the skin edges.

Dr. Alfred S. Taylor said that he had been so unhappy as to have had three ruptures following transverse incision. It had seemed to him, however, that the exposure and the working facilities are so much better with a transverse incision for the pyloric region and the gall bladder region as to make it worth the chance.

Some of the hernias have been due to wound infection. Unfortunately, perhaps they had had an unfair proportion of wound infections at Fordham, and three or four ruptures had occurred there. The fourth one occurred in a hospital which usually gives perfectly good results so far as asepsis is concerned. Just why the infection occurred there, one is not able to explain, but the rupture didn't occur until some ten or twelve weeks after the wound had healed solidly. When the patient left the hospital the wound was perfectly solid in every way and he thought there would be no difficulty whatever, but after some ten or twelve weeks he was called up and told that there was a large protrusion of the skin just above the scar; the rectus in that case had apparently separated through its entire width, a distance of two and a half inches.

Dr. Winfield S. Schley said that he was rather surprised that the silk or the silkworm retention suture is not used oftener. It is rather unsightly and it leaves telegraph pole marks on the skin if drawn too tight, but there are a goodly number of cases, such as in carcinoma and where poor repair is to be expected, where it can especially be used to advantage—put through the skin, through the fascia, with or without including muscle, brought out and tied after the layer sutures are in, and cut out at the end of ten or twelve days. He did not remember to have had a single wound pull apart under such circumstances. It is rather a nuisance, and patients at the present day don't like having sutures removed, but it saves many wounds from opening up, used in this way, as an addition to the regular layer suture.

It is largely a question also of technic; sutures should not be too tight or cutting results, with pain and scarring. They should be tied only tight enough to barely approximate the skin, or not even that where the abdominal wall is thick, as wound swelling always tightens them more.

Dr. Burton J. Lee said the only case he could remember having had break open in the last two years was one in which silkworm gut was used. He practically had given up the use of silkworm gut. It seemed to him that silkworm gut does not hold, but cuts whatever it is put into. The difficulty with most deep sutures is that the materials are often defective. Without mentioning any manufacturers' names, he had the feeling that a good deal of gut is put out that is defective in tensile strength.

Dr. Herman Fischer said that for the last four years he had made the transverse abdominal incision a routine incision for his upper abdominal work, especially in gall-bladder work and in perforation of the duodenum or stomach near pylorus. He always added a median incision, since it gives such a very excellent exposure to all the sutures beneath. He had used the longitudinal rectus incision for a long time until he came across a few cases, especially in elderly and very fat women, in which there was a very extensive atrophy of the whole rectus muscle with a very large bulging of the upper part of the abdomen, a condition that gave those women quite some distress.

As far as the breaking open of wounds is concerned, he thought that it has happened to him as to everybody else. The break usually occurs between the seventh and tenth days. For six or seven years he had used very heavy through-and-through silk sutures in addition to a careful layer suture in all his upper abdomen work in midline incisions, especially in men in whom gastro-enterostomy had been performed or resection of the stomach, men of very lean and very emaciated physique, in whom the power of repair of the tissues is below par. There is no infection, but the cut tissue simply does not heal together. He was very well satisfied with this combined suture.

Dr. Parker Syms said that he had no experience to speak of with the transverse incision. As to the proper manner of suturing the abdominal wall, he thought deep sutures should always be employed. This is not only for the purpose of preventing gaping of the wound and evisceration, but, what is of equal importance, to make the wall homogeneous and to avoid pocketing and the escape of blood into pockets of the wound. Of course if a wound is sewed in layers it is sewed into sections and pockets. By incorporating the entire thickness of the wall by these deep sutures that possibility is avoided.

If this is done he thought incidentally a certain number of pulmonary emboli would be avoided.

Dr. Alfred S. Taylor reported a case in which the longitudinal incision of the rectus had been used and was apparently healed perfectly well. The sutures had been removed on the sixth day with a very good primary union. On the twelfth day the wound split open without any effort on the part of the patient, no coughing, no strain of any kind, no vomiting. No attempt at healing had ever taken place during the twelve days.

It looked just like the wound that one makes in a cadaver and leaves for a time and then goes back and looks at it. They put his intestines back and made the best suture they could. He wasn't in very good shape and they didn't give him an anæsthetic. After they got him back to bed Dr. Rogers came in and he drew out of his pocket a little bottle of thyroid residue and said, "Give him some of that," which they did. The wound healed solidly that time. It seemed to stimulate his healing capacity.

Dr. Charles N. Dowd added a word for the use of silkworm gut. For several years he had used it in the routine closure of abdominal wounds, placing the stitches through the skin and fascia and reversing the direction of the fascial part of the stitches, figure-of-8 fashion. The wound edges had held remarkably well, and it has seldom been necessary to use chromic gut. He avoided chromic gut on account of its uncertain absorbability.

TREATMENT OF ERYSIPELAS

Dr. Seth M. Milliken read a paper on the above subject, for which see page 129.

Dr. Alexis V. Moschcowitz asked whether erysipelas cases are isolated at Bellevue Hospital, and, if they are, why they are isolated. At Mt. Sinai Hospital erysipelas patients are not isolated; they are kept in a separate room adjoining the general surgical wards; so to speak, under erysipelas precautions, which really do not amount to very much. Dr. Moschcowitz does not recollect having seen a single case of secondary infection.

Dr. John F. Erdmann said that for the last two years in his service at Bellevue Hospital they did not transfer them immediately. They are perfectly willing to keep them alongside of the next patient, but prefer that they are removed. In so far as patients have gone, we have not had one single contamination. In a case not long ago there was absolutely no attempt on the part of the institution to produce any isolation; the nurses intermingled, and there was absolutely no contamination. He did not believe that it was necessary to isolate erysipelas patients.

Dr. Arthur S. Vosburgh said that he had had charge of a Bellevue service in the summer for quite a number of years, and when in charge he was often on duty in the wards, and after making his rounds in the erysipelas wards he always went up and finished his operating, and did not know of a single case that contracted erysipelas from the fact that he was on duty in both services.

Dr. Charles N. Dowd said that he had been attending surgeon in at least one of the hospitals that had been mentioned, and he remembered a case of erysipelas which occurred in the ward and was moved into a little room off the ward, and much more careful precautions taken than apparently are taken in these cases that had been spoken of.

However, two or three patients in the hospital contracted the dis-

ease, as did one of the nurses, who was very ill and also suffered most severely from the constitutional effects of the inflammation. Hence after that experience they were very careful where the erysipelas cases were put. If they go into a little room off the ward, or in a single room anywhere, they insist they have precautions which are fairly strict—that is, nurses and doctors who take care of them use gloves and gowns and do not come into contact with other patients until a careful cleansing has supervened.

Dr. John Douglas was in charge of the erysipelas wards in Bellevue for several years some years ago, and he never saw a case of erysipelas developed in those wards, although they had during that time a considerable number of cases sent into the ward with a diagnosis of erysipelas that had cellulitis or some other condition.

In his first year of service in the erysipelas ward an attempt was made by one of the other surgeons to give a patient erysipelas, who had had an inoperable sarcoma. He was vaccinated, scratched, and serum inoculated from another patient's blebs, but it was absolutely impossible to develop erysipelas in this man.

At the same time in another hospital, where every precaution was taken, he remembered very distinctly a case of a patient developing erysipelas, who was removed at once and every precaution taken to isolate him, but the next patient who went into that corner of the ward developed erysipelas.

Dr. Ransom S. Hooker thought most of the surgeons connected with Bellevue Hospital felt that with ordinary caution there is very little chance of spreading erysipelas; however, a very curious coincidence happened about a year ago. While they were still in the old buildings they moved the erysipelas patients to a ward which was beyond the men's surgical, the only entrance to which was through this surgical ward. During the few months it was there three cases of erysipelas broke out in this surgical ward in postoperative cases, which, to the best of his memory, had not happened before, at least in the past ten years.

Dr. Seth M. Milliken said that erysipelas is isolated at Bellevue because it is the dumping-ground of the other hospitals' erysipelas cases. Also, there is a city rule that erysipelas must not be treated in the general ward, but must be sent to a special division.

As to infection occurring in erysipelas wards, there was one nurse infected in that ward in the last four years. That was a male nurse who had a severe cold at the time and got erysipelas in the nose, which spread over his face. When the erysipelas was in the old building the cases of measles, for temporary isolation, before being taken by the Board of Health, were kept in that same ward—children who had whooping cough were kept in that same building, just around the corner, and in none of those patients did erysipelas develop.

Three years ago in Lincoln Hospital he treated three cases of erysipelas in the general surgical ward. They were not sent to isolation at all and no other cases of erysipelas developed.

Stated Meeting held March 28, 1917

The President, Dr. Charles N. Dowd, in the Chair

UPWARD DISLOCATION OF THE TARSAL SCAPHOID

Dr. Howard D. Collins presented a man, thirty-nine years of age, who on the 12th of February last stepped on a round piece of wood, stepping with the front part of his foot, and his foot turned under him, with the result that he received a dislocation upward of the tarsal scaphoid together with a fracture of its inferior and posterior lip.

Two unsuccessful attempts were made, one without an anæsthetic, and one with, to reduce this dislocation. Then under anæsthetic Dr. Collins made a curved incision on the inner side of the foot and succeeded with the periosteal elevator in prying the bone back in place. When reduced a plaster bandage was applied and has now been worn for five weeks, and he can get around on his feet fairly well.

OBSTRUCTION OF THE COMMON DUCT: CHOLECYSTECTOMY

Dr. Collins presented also a man on whom he had operated two years before for gall-stones, which he removed without the removal of the gall bladder itself. The patient remained well two years, when he was operated upon for double inguinal hernia. Four days after this operation, while in bed, he was seized with very violent pain in the abdomen, referred to the region of the old gall bladder operation. On the following day the doctor cut out the old scar and found evidences of fresh separation of the rectus muscle. The wound was sutured, but four days later there was a renewal of very violent pain in the abdomen. Examination showed a dense, tense globular mass about one inch in diameter, which felt as if there was a hernia forming in the site of the gall bladder incision. The incision was re-opened and revealed a very greatly distended gall bladder pressing up against the abdominal wall, but the suture line in the abdominal wall was perfectly intact. One gall-stone was found in the neck of the gall badder, which had caused the trouble. Dr. Collins then removed the gall bladder with its contained stone, and the patient has made a practically uneventful recovery.

SEPTIC INFECTION OF KIDNEY AFTER INFECTION OF FINGER

Dr. Herman Fischer presented a man, twenty-four years of age, who had been ill for about three weeks with an infection of his left index finger which was incised. After some time he developed severe pain

in his right side with high temperatures. Slowly a swelling in his right lumbar and hypochondriac region developed that reached nearly to the umbilicus and down towards the anterior superior spine of the ilium. The swelling was tense and extremely painful. Patient had the appearance of a very sick man. Temperature 103.8°, pulse 140. Blood examination showed 20,400 leucocytes with 85 per cent. polynuclear cells, 4 per cent. large lymph and 11 per cent. small lymph. Urine examination, acid, clear amber, trace of albumen, a few pus-cells, and an occasional granular cast. *Diagnosis*, Perinephritic abscess.

November 7, 1917, an incision into the perinephritic region was done, and a large quantity of thick creamy pus evacuated. As the patient's condition was very poor, the kidney was not explored. The abscess cavity was drained.

On the first day after the operation the temperature dropped to normal, but quickly rose again to 102° in the morning and 103° in the afternoon. The abscess cavity had cleaned up almost entirely in about ten days, and there was hardly any secretion from the wound. In spite of this the temperature kept up. It was now clear that the kidney must harbor an infectious focus, as no other cause for the high temperature could be found. Three weeks after the first operation an exploration of the kidney was decided upon. On enlarging the wound the kidney was found quite tightly embedded in the remnants of the fatty capsule, which was quite infiltrated and firmly adherent to the kidney. The kidney was enucleated and removed. On inspecting the specimen it showed that the interior half of the upper pole of the kidney had become necrotic and completely sequestrated. In the pus of the sequester staphylococcus aureus was found. After the nephrectomy the temperature came down quickly to normal, and the patient made an uneventful recovery.

UNILATERAL SEPTIC INFECTION OF KIDNEY

Dr. Fischer presented also a young woman, twenty-five years of age, who was operated upon four years ago for an appendicitis abscess. Four months ago she was suddenly taken ill with severe pains in her right hypochondrium, radiating into the back. She was nauseated and vomited frequently and copiously. She also had fever. She was confined to bed for one and a half weeks. She recuperated from this attack and felt fairly well until one week before she entered the hospital. At that time she again had an attack similar to the previous one, except the pain in her right side was much more severe and she felt much sicker. When admitted, the right side of her abdomen was held rigid; there was marked tenderness over the lumbar and iliac regions. A large, tender mass could be felt in the right lumbar region, fairly well outlined and not movable. It extended downwards one and one-half inches below umbilicus and disappeared upward under the ribs. Bimanually

the mass was easily palpable and appeared to belong to the kidney. Temperature 103.8°.

Cystoscopic examination and catheterization of ureters showed the bladder mucosa to be slightly injected. Ureter openings normal. Urine from right side: Acid, spec. gr. 1015, clear. Trace of albumen, many pus-cells, some red blood-cells, occasionally hyaline cast. Urine from left side: Acid, spec. gr. 1015, clear, trace of albumen, a few leucocytes. Functional test, normal for both kidneys.

Under a diagnosis of septic infection of right kidney, nephrectomy was done. The kidney was found considerably enlarged, measuring 12 cm. from pole to pole, about 7 cm. transversely, about 3 cm. anteroposteriorly. The capsule was easily stripped from the organ, leaving a pale yellowish-brown surface marked profusely by yellowish, raised areas ovoid or circular in form, measuring about 6 mm. in diameter. These elevations were soft and surrounded by a narrow zone of congestion. The smaller ones were crowded together near one pole and the largest, measuring about 2 cm. in diameter, situated along the convex margin. On section these raised areas on the surface are seen to correspond with wedge-shaped areas penetrating the entire thickness of the secreting parenchyma, where the renal tissue is soft, pultaceous, and necrotic. Smears from these areas show innumerable polymorphonuclear leucocytes, but no very definite microörganisms. The calyces are not dilated and the mucosa of the calyces and pelvis does not appear thickened or inflamed. Here and there are small petechiæ. The kidney parenchyma between the infarcts is pale and slightly swollen, shows no very marked alteration. The larger vessels of the hilus contain no visible thrombi.

Microscopical examination of section passing through one of the wedge-shaped areas noted in the gross specimen shows in this region the renal tissue to be diffusely infiltrated by polymorphonuclear leucocytes so densely the original renal elements are practically entirely obscured. Here and there the remainder of tubules can be found, the lumens of which are crowded with pus-cells, and also here and there a few glomeruli. Necrosis and liquefaction, on the other hand, is comparatively slight, although the centres of a few of the larger areas appear to be undergoing commencing liquefaction. The margins of these infected areas are fairly sharply marked off. The adjacent renal epithelium, however, appears degenerated and similarly necrotic. Rather hemorrhagic areas are noted. In the section examined no definite thrombus was noted in any of the areas, but the distribution and shape of the infected areas leave the hæmatogenous origin beyond a doubt.

Cultures from the kidney show in pure culture a dextrose fermenting Gram negative bacillus which fails to ferment lactose promptly, *i.e.*, one of the intermediate typhocolon group.

Dr. Edwin Beer believed, as the result of a number of articles written in recent years, that a great many kidneys have been sacrificed unnec-

essarily. It is generally considered that hæmatogenous infected kidneys should be nephrectomized. A protest is timely against doing regularly nephrectomy in these cases. There are two very distinct types of case —one case associated with pyuria and colon bacillus, and the other without pyuria, usually with a few red blood-cells and usually due to staphylococcus aureus. Almost invariably one can get along without a nephrectomy in the colon pyelonephritides, decapsulation or nephrectomy meeting the indications in even severest cases, while no operation may be necessary in milder cases unless there is a stone in the kidney (and if there is a stone there it should be removed), while the second group of cases will very frequently have to be nephrectomized, though resection may at times be satisfactory.

In one of these cases Dr. Fischer had shown there was a colon infection, or colon group infection. That type of case can almost regularly be cured without losing the kidney. As far as the carbuncles are concerned, the staphylococcus aureus infarctions leading to multiple abscesses are less common.

CONSERVATIVE AMPUTATION THROUGH THE UPPER THIGH— DISINFECTION OF THE STUMP BY THE CARREL METHOD

Dr. H. H. M. Lyle presented a boy who, ten years ago, sustained an injury to the knee which resulted in an infected arthritis and an osteomyelitis of the femur. Six extensive operations have been performed and several minor ones. In spite of this treatment the condition has grown steadily worse. The condition of the femur is shown in the accompanying radiograph (Fig. 1). There are 7 actively discharging sinuses; two of these are within 3 inches of the anterior superior spine.

The radiograph shows that the osteomyelitic process extended up to within an inch of the great trochanter; the bone above this point appears to be healthy. Knowing the unsatisfactory functional results and the difficulties of fitting a suitable artificial limb in a disarticulation, he determined to do an aperiosteal amputation, making the bone section one inch below the trochanter. As the sinus tracts had to be crossed, he followed the method of open amputation and went through the infected area; this is a common practice in military surgery. The stump was disinfected by the Carrel method and the flaps approximated by traction. The result is very satisfactory (Fig. 2). Despite the very short stump, the boy walks well and bears all his weight on the end of his stump (Fig. 2). The provisional plaster peg-leg (Fig. 3) was made by the head nurse. It is the first one she had ever seen or made, so one sees it is not a very difficult thing to do.

Dr. Charles N. Dowd said that in hospital service, with frequently changing house-surgeons, it is difficult to secure artificial legs such as Dr. Lyle describes. The molding and fitting of the plaster requires time and a certain degree of skill. A carpenter and a harness-maker,

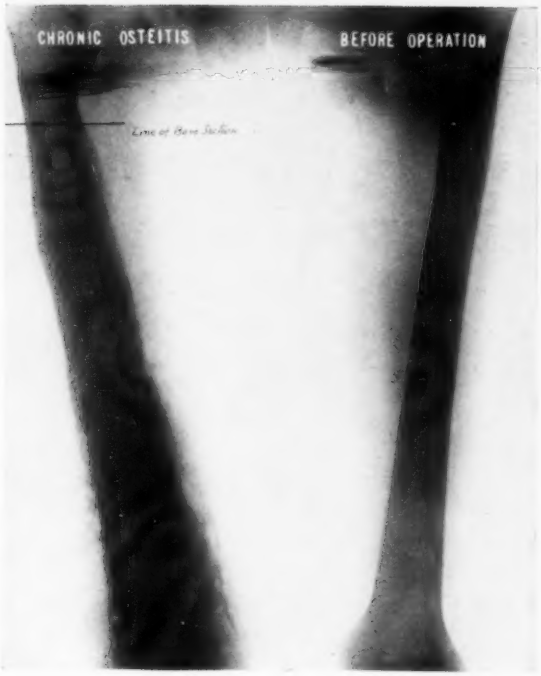


FIG. 1.—Radiograph of the right femur, showing the extensive nature of the osteomyelitis. Note the line of bone section one inch below the great trochanter.

FIG. 2.—Patient performing his weight-bearing exercises to prepare his stump for a temporary peg-leg.

FIG. 3.—Patient wearing the temporary peg-leg.

however, provide a very good apparatus. The former makes the peg, of suitable length and with a suitable notch at the top, and the harness-maker makes a leather cuff which encircles the thigh and makes a suitable housing for the padding on which the end of the stump rests. The procedure is thus simplified.

VALVULAR CÆCOSTOMY FOR COLONIC ILEUS

DR. EDWIN BEER presented a feeble woman of seventy-four years. Constipation developed for the first time eight days before admission, and during this period the bowels did not move adequately, though some flatus and particles were brought away by means of repeated enemata. Vomiting and extreme distention developed. No masses were palpable, and barium enema X-ray did not show the seat of obstruction, as the whole colon filled up to the iliocæcal valve. The distention of the cæcum was extreme, both by percussion and in the X-ray.

On December 7, 1914, under local anæsthesia, the abdomen was opened in the region of the cæcum, and, owing to the general condition of the patient, as well as to the enormous distention of the intestines, no extensive search was made for the cause of the ileus. The huge cæcum was so stretched that its serosa had ruptured in several spots, and scattered over its wall were numerous areas of what looked like suppurating foci. It was decided to evacuate this part of the bowel and do a cæcostomy of the Witzel type, infolding several layers of cæcal wall. This was readily done and the patient made a satisfactory recovery. All subsequent abdominal examinations, as well as X-ray studies, failed to show a tumor or a stricture of the colon. The bowel shortly after the operation emptied itself, after irrigation through the cæcostomy tube, by the normal channel, but that lasted only a few weeks. Since over two years all the intestinal contents are washed out every day or every other day by means of lavage through the cæcostomy tube, nothing being discharged through the rectum. All this time the patient has no trouble in keeping herself absolutely clean and odorless.

Judging from the course of this case, Dr. Beer believed the case to be a benign obstruction due to pericolonic adhesions probably at one of the upper flexures. It demonstrates the great value of a valvular artificial anus in the cæcum, and how readily the patients can keep themselves immaculate under such circumstancs.

ASEPTIC AMPUTATION OF THE RECTUM AND POSTERIOR VAGINAL WALL FOR CARCINOMA

DR. BEER presented two cases to illustrate a modification of the usual Kraske technic, which permits of an absolutely clean dissection and amputation of the rectum without opening the bowel till the wound is well sealed. Both cases had their growths in the same place, involving the

anterior circumference of the bowel, and were so close to the vaginal wall that it seemed involved. The growths were about the size of a silver dollar, ulcerated, and of the type of adenocarcinoma. In both cases the operation could be preceded by a thorough emptying of the bowels by castor oil, as there was no stenosis.

The modification of the usual technic was as follows: The anus was sewed together with heavy silk. Then a flap of skin was dissected up from around the closed anus and this was in turn sewed over the closed anus, so as to avoid any leakage during the subsequent steps. After removal of the coccyx the gut and tumor were dissected free into the peritoneal cavity in the typical way, ample gut being brought down so as to fit readily in the upper angle of the incision. Then a heavy silk ligature was tied around the gut just beyond the skin level, and the wound in the soft parts was almost completely closed by sutures. The sigmoid was attached in the wound by sutures through its outer coats. The wound was dressed with vaselined gauze and then a clamp was placed upon the projecting piece of closed gut and its contained tumor, about one inch from the heavy silk ligature. With cautery the section was then made, removing the rectum and posterior vaginal wall without contaminating the wound.

Depending upon how the patient stood the complete occlusion of the gut, the wound was left alone. When distention developed, the silk ligature was cut from the sigmoid and a tube inserted. During these three to five days, the period in which in these cases the total occlusion lasted, the complicated wounds had an excellent chance to heal, and the patients made a rapid and uneventful recovery.

TUMOR OF THE CAROTID BODY, EXCISION WITH LIGATURE OF THE CAROTID ARTERIES

Dr. Winfield S. Schley presented a man, thirty-seven years of age, who entered the hospital in April, 1916. He presented at that time an oval mass about an inch and a quarter long by three-quarters of an inch broad just internal to the middle of the right sternomastoid. He declared that it was first noted twenty years ago (about the age of seventeen), and has slowly increased in size, more rapidly the last two or three months. The skin and subcutaneous tissues were movable over it, but the mass was considerably fixed. A distinct pulsation was transmitted and expansive in type. It was possible to reduce the size of the tumor by digital compression. It would expand fairly quickly on relief of pressure. There were no other masses or glands left. Wassermann not taken.

A four-inch incision was made along the sterno-mastoid. Dissection, difficult because of innumerable venous and small arterial communications, especially at the upper pole. Carotid was compressed by finger after the tumor mass was dissected free. It caused no apparent change

in the pulse, color, or respiration of the patient. After five minutes it was ligated with two strands of No. 2 chromic. Above, the artery on emergence from the growth was of the diameter of crow quill (4 mm.). This fact, together with the apparent hopelessness of dissecting free and the feeling that it was possibly malignant, decided the question of *excision of the carotid.*

Douglas reported a case in 1909 and referred to Keen's paper with 27 collected cases (operative) with a 27 per cent. mortality—due principally to pneumonia from cutting vagus. Four cases had recurred to time of report, with one death and the other three with death in prospect.

In 18 cases all three carotids were ligated.

Douglas also collected five additional cases, with two deaths up to time of report (one operative, from hemorrhage and shock, and one from recurrence). Thus making 32 operated cases up to 1909. Operative mortality, 25 per cent. Recurrence in nearly 20 per cent.

Callison and Mackenty in April, 1913, collected 29 more cases in living and one autopsy case. Up to 1913 about 61 cases, with *54 operative.* Of these: In 4 no removal attempted. *All three carotids ligated in 32.* In 15 cases the tumor was dissected away from vessels. *In 8 cases recurrences occurred after dissecting away from vessels, but in only 2 cases after removal of carotids.*

Of the 54 cases operated upon, 42 have recovered (operative recovery), and 12 died. Ten more died from recurrences, local or metastatic, making 22 deaths in 54 cases operated up to 1913.

Causes of death given as pneumonia, hemorrhage, cerebral anæmia, œdema of the lungs, and sepsis.

There has been hemiplegia with aphasia in 4 cases, temporary or lasting laryngeal or facial paralysis in a number.

Winslow, in May, 1916, reported two more and collected 12 additional cases, making about 75 reported cases up to that time, the case presented to-night making the seventy-sixth found. It conformed in detail with those reported in the literature. It was of long duration for the most part. It had attached itself to and compressed the carotid, and had many vascular connections with difficult dissection. It was felt that it had involved the carotid wall so as to be dangerous to attempt separation. The external carotid was not seen, and the common carotid at its emergence from the growth so narrowed that circulatory disturbance was not considered likely on ligation, compensation probably having occurred or collateral circulation developed through external carotid. The added risks and seriousness of the carotid excision were carefully weighed, but it was felt that we were dealing with potential, if not actual, malignancy. The only post-operative condition of any note was the huskiness of the voice for several weeks, now practically gone.

The chief interest lies in the common carotid excision, favored un-

questionably by the existing compression of the vessel, and the excision of vessels with growth as promising greater chance of cure, as is well shown in the collected cases. Ligation of the *common* carotid may be safer procedure in some conditions than ligation of *internal* and *external* simultaneously, as in the latter condition we prevent collateral circulation through the medium of the external vessel.

An examination of this specimen after its return by the pathologist shows that all three carotids were included in the ligatures and excisions. The external coming off from the common and overgrown and compressed by the mass, was not recognized at the time, so small was it at its exit from the growth. The case is therefore one of excision of carotid body tumor with common, internal, and external carotid arteries.

CHRONIC SUPPURATIVE OSTEOMYELITIS

Dr. Walton Martin presented three cases of chronic circumscribed suppurative osteomyelitis, or the so-called chronic abscesses of the tibia, described first by Brodie.

They illustrated the circumscribed abscess in bone shut in by thickened and sclerotic osseous tissue and remaining latent for twenty or thirty years. In all of them active microörganisms were obtained, yet they all healed promptly after removal of the roof of the bone cavities and pyogenic membrane.

They presented a very different picture from ordinary acute osteomyelitis.

In all three cases the radiographs had failed to differentiate the abscess cavity from the shadow made by the thickened sclerotic bone.

ECHINOCOCCUS DISEASE OF THE KIDNEY

Dr. J. J. Russell read a paper with the above title.

Dr. William A. Downes said that he presented a case of echinococcus cyst of the kidney before the Society about two years ago. This case was not diagnosed beforehand; it was a very large tumor in the left kidney and was removed with a great deal of difficulty. Diagnosis was made during the operation by the fact that the capsule broke and the cysts were recognized. Recovery was rather slow, as the wound became infected, but he eventually made a good recovery. About a year ago he was still well. He has not been heard from since.

He also was an Italian.

Dr. Edwin Beer called attention to one point in connection with the diagnosis based on the history, which may be very misleading. He had seen one case of echinococcus on Dr. Moschcowitz's service, and he had seen one case in which the clinical history of the passage of lima-bean-shaped masses suggested echinococcus. But these proved to be a type of proteid cencretion formed in the pelvis.

Dr. Arpad G. Gerster said that about twenty years ago the case

of a patient suffering from hydatids of the kidney was presented in a paper printed in the June issue of 1897 of the American Journal of Medical Sciences. The patient was a woman, twenty-six years old, pregnant in the sixth month. Years before, one of her duties used to be the feeding of dogs.

For a long time dull pain was felt in the right loin. It became more severe from the third month of her pregnancy on. A large tumor developed; could be easily palpated, because she had lost much flesh. There was no fever and the urine did not present any characteristics that would point to this trouble with one exception. A few days before seen she had passed a number of grape-like bodies which were immediately recognized as hydatid cysts. Thus the diagnosis was made easy.

Aside from its rarity, there were other unusual features present which rendered treatment exceedingly risky and difficult. Relating in chronological order the surgical procedure adopted, he gave a picture of the pathological conditions. On attempting puncture, a stout needle was broken by a resistance comparable to that of bone.

The mass was ovoid in the main, about the size of a cocoanut, presenting at its anterior and inferior aspect a secondary knob-like projection of lesser size and softer consistency, which was very tender. The bulk of the mass was not sensitive at all and of stony hardness.

After exposure it was found that the projecting node of the mass was the remnant of the kidney. About three-quarters of the organ were still intact, masquerading in the guise of an attachment to the tumor. The trouble had started from the upper pole of the kidney, the mass projecting upward to the seventh rib and extending downward to the level of the umbilicus. The calcareous envelope of the mass proved so resistant that entrance had to be made by the use of a resecting knife and a small saw at the cost of much labor. Finally a square-shaped trapdoor, as it were, could be raised, when it was found that the calcareous shell was filled with the well-known dense conglomeration of membranes resembling the outside silky envelope of a red onion.

The first thing done then was to evacuate. All this material was scooped out. The hemorrhage following this was considerable; it must have come from an organized lining of the inner surface. The walls of this cavity consisted of dense, calcareous plates (some of them a quarter of an inch thick), each segment irregular as to periphery, its convex surface, however, in strict conformity with the ovoid form. The segments were held together by connective tissue, the lines of union resembling those of infantile cranial sutures. Evidently the inner lining drew its blood supply from the vessels of these sutures.

Cases of complete calcification of the sac of a hydatid cyst are extremely rare.

Simon, of Heidelberg, was the first to operate upon a calcareous hydatid cyst of the kidney. He warns against attempts at extirpation. The

connection of the sac with adjacent cavities, such as the pleura, pericardium, and peritoneum, is close and extensive. Dissection without invading the cavities is rarely possible. In Simon's case this advice was sound, for he had to deal with a case of incomplete calcification. The calcareous plates did not offer an insurmountable obstacle to a cure, for they did not hinder the collapsing of the sac. The shell being complete in my own case, such an approximation of the walls was impossible as long as the calcareous matter remained in place. The woman's condition was poor; she was pregnant, and an inevitable process of prolonged suppuration was a serious menace. There was, therefore, no choice. We had to go ahead. When the packing was removed, with which the cavity was filled at the first operation, we found the shell rigid like that of an unbroken egg and unyielding even to energetic efforts at crushing by external pressure. The successive dissection of these calcareous plates had all to be done with the knife, step by step, under great difficulties.

The pleura was widely opened; failing cardiac function, due to the collapse of the lung, was overcome by immediate plugging and artificial respiration. The situation was desperate, but persistence was rewarded by complete success, for, the syncope being overcome, the woman left the table alive, though in a state of deep depression. Of course, the peritoneum was also opened as a matter of necessity, for the wall of the sac was inseparably incorporated with this membrane. Repeated and dangerous attacks of cardiac failure had to be combated for two days with every known method of restoration.

Finally she emerged from danger and made a complete recovery. The cavity contracted and closed rapidly. The patient was discharged cured three weeks after the second operation. The pregnancy miscarried.

It may be added that, as a matter of course, the healthy portion of the affected kidney was preserved.

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